A Study on Alliance Factors That Influence Firm Performance Alliance Strategy, Alliance Diversity and Alliance Capability

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Abstract

This thesis is structured as three papers and aims to explore three main alliance factors that relate to firm performance, with a sample of China and Taiwan companies from the printed circuit board industry and plastic rubber industry. Firm performance depends on firm strategy and how resources are configured. A critical alliance factor is alliance strategy, which can determine how firms form and operate their alliances. Alliance strategy can be either a standalone strategy or a portfolio strategy. I attempt to determine (1) if managerial characteristics and compensation package relate to the choice of alliance strategy; (2) if alliance strategy impacts on alliance diversities and firm performance relationships; (3) if alliance capabilities impact on the alliance strategy and firm performance relationship.

Paper 1 builds on upper echelon theory and agency theory. I theorise that managerial characteristics and compensation package are the key determinants to understand why executives adopt different alliance strategies. The results show that tenure, executives' educational background, functional background and variable pay are important to predict the choice of an alliance strategy.

Paper 2 builds on the resource-based view. I explore the alliance strategy as a moderating influence between alliance diversities (partner, functional and governance) and firm performance. The results show that alliance strategy impacts on partner diversity and firm performance. However, it does not impact on the functional diversity-firm performance and governance diversity-firm performance relationships. Governance diversity is related to firm performance only when partner diversity is also considered.

Paper 3 builds on the resource-based view. I suggest that alliance capabilities are a mediating influence between alliance strategy and firm performance. The results demonstrate that individual alliance capabilities complement standalone alliance strategy, and portfolio alliance capabilities and individual alliance capabilities both complement portfolio alliance strategy.

Theoretical contributions, possible future research and managerial implications are discussed in relation to current theories of alliance strategy, alliance diversity and alliance capabilities.

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I. INTRODUCTION

Strategic alliance has been extensively studied in the field of strategic management, international business, knowledge management, organisational theory and economics (Singh and Mitchell, 2005). Gulati (1998) defines strategic alliances as voluntary arrangements between firms involving exchange, sharing or co-development of products, technologies or services. The aim of this cooperative arrangement between firms is to improve their competitive position and performance by sharing resources (Hitt et al., 2000, Jarillo, 1988). Over the past few decades, researchers have tried to explain how firms can create successful strategic alliances and contribute to firm performance (Parkhe, 1993, Gulati, 1995a, Gulati, 1995b, Doz, 1996, Eisenhardt and Schoonhoven, 1996, Simonin, 1997, Gulati, 1998, Gulati and Singh, 1998, Anand and Khanna, 2000, Baum et al., 2000, Chung et al., 2000, Dussauge et al., 2000, Hitt et al., 2000, Stuart, 2000, Ahuja, 2000a, Ahuja, 2000b). Scholars have shown that strategic alliances provide many benefits to the firms such as access to critical resources and capabilities, gaining legitimacy, facilitating innovations and accelerating international market entry (Baum et al., 2000, Brouthers et al., 2014, Powell et al., 1996, Nakos et al., 2014, Pisano, 1990, Shan et al., 1994, Teece, 1992). Despite this, strategic alliances have high failure rate, with studies showing that 50% of alliances fail (Greve et al., 2010, Park and Ungson, 2001). In

addition, the variation in performance outcomes for firms engaging strategic alliances is high (Ireland et al., 2002).

In today's business landscape, firms are commonly engaged in multiple alliances, not just single alliances. They face challenges in managing multiple strategic alliances simultaneously (Anand and Khanna, 2000, Doz and Hamel, 1998, Gulati, 1998, Hoffmann, 2005, Hoffmann, 2007, Lavie, 2006, Lavie, 2007, Lavie and Miller, 2008, Ozcan and Eisenhardt, 2009, Parise and Casher, 2003). Scholars have used different theoretical orientations to study the phenomenon of multiple strategic alliances such as the resource-based view (e.g. Ahuja, 2000a, Ahuja, 2000b, Lavie, 2006), transaction cost economics (Goerzen and Beamish, 2005, Goerzen, 2007), learning and knowledge (e.g. Anand and Khanna, 2000, Deeds and Hill, 1996, Hoang and Rothaermel, 2005, Kale et al., 2002), social network theory (e.g. Baum et al., 2000, Capaldo, 2007, Goerzen and Beamish, 2005, Goerzen, 2007), dynamic capabilities (Kale et al., 2002), agency theory (Reuer and Ragozzino, 2006) and resource dependency theory (Bae and Gargiulo, 2004, Ozcan and Eisenhardt, 2009). This body of work suggests that there are two kinds of alliance strategies: *standalone* strategy, whereby firms manage each of their alliances independently from each other, and *portfolio* strategy, whereby firms manage all their alliances together as a portfolio. Despite the distinction between the two kinds of alliance strategies, scholars have not

explored why top managers choose one strategy over another. From a strategic decision-making perspective, the factors that lead to a standalone or portfolio strategy remain unclear.

Furthermore, firms engaging in multiple alliances are likely to have a diverse set of alliances. Diversity can be diversity in partners, diversity in functions and/or diversity in governance structure (Jiang et al., 2010). Scholars have been interested in whether alliance diversity brings better or worse firm performance (e.g. Duysters and Lokshin, 2011, Goerzen and Beamish, 2005, De Leeuw et al., 2014, Hoehn-Weiss and Karim, 2014, Koka and Prescott, 2008, van Beers and Zand, 2014). The results so far have been mixed. Some studies show that partner diversity has a U-shaped relationship with firm performance (Jiang et al., 2010, Goerzen and Beamish, 2005), while others show that partner diversity has a positive effect on venture performance (Terjesen et al., 2011). Although scholars have investigated the relationship between alliance diversity and firm performance in the context of multiple alliances, they have not factored in the effect of a firm's alliance strategy. Would a firm's alliance strategy influence the relationship between diversity and performance?

Finally, the alliance scholars highlight the existence of alliance capabilities either with regards to managing individual alliances (Schreiner et al., 2009) or in relation to managing a portfolio of alliances (Schilke and Goerzen, 2010, Sarkar et al.,

2009). The capability of managing individual alliances is different from that of managing a portfolio of alliances (Wang and Rajagopalan, 2015). However, we do not know whether these capabilities will help firms to perform better when implementing a specific alliance strategy for managing multiple alliances.

1.1. Purpose of Study

The purpose of this research is to address the gaps in the alliance literature with respect to how firms manage multiple alliances. In terms of alliance strategy, we know very little about why firms choose one alliance strategy over another (standalone over portfolio or vice versa). I draw on upper echelons theory and agency theory to investigate whether top managers' background and compensation packages influence the choice of alliance strategy. I develop and test the theory that top managers' demographic characteristics may influence the choice of alliance strategy. In addition, I draw on agency theory to test the moderating effects of compensation package, as well as that of equity ownership, on the relationship between demographic characteristics and firm alliance strategy.

Alliance diversity is an important topic in the alliance literature because the notion of diversity indicates a firm's potential access to heterogeneous resources (Wassmer, 2010, Lavie and Miller, 2008). According to the resource-based view, resource heterogeneity is the basic condition to achieve competitive advantage

(Peteraf, 1993). Scholars generally agree that alliance diversity is related to a firm's financial and innovation performance (Baum et al., 2000, Sampson, 2007, van Beers and Zand, 2014). However, a high level of diversity can also create extra managerial challenges and impact negatively on firm performance (Goerzen and Beamish, 2005, Koka and Prescott, 2008). The effect of diversity on firm performance appears to be inconclusive in the literature. I seek to explore whether the mixed results in the literature on alliance diversity and performance may be explained by a firm's alliance strategy. I argue that having a standalone strategy is different from having a portfolio strategy when managing multiple alliances. Firms that choose one strategy or the other may leverage diversity differently, and this can influence the way diversity impacts performance. For example, a portfolio strategy encourages managers to consider how to integrate different resources from alliances together, whereas a standalone strategy may not. This implies that a portfolio strategy may strengthen the relationship between diversity and performance. My study seeks to find out how the choice of alliance strategy moderates the effect of alliance diversity on firm performance.

Drawing on the resource-based view, scholars have highlighted the importance of alliance capabilities for explaining alliance success or failure (e.g. Anand and Khanna, 2000). Capabilities determine how well a firm uses its resources to achieve its objectives (Amit and Schoemaker, 1993, Makadok, 2001). In the alliance literature,

scholars distinguish the capabilities needed for managing single alliances from those needed for managing alliances as a portfolio (Wang and Rajagopalan, 2015). The success of strategy implementation is highly dependent on firm resources and capabilities (Miles and Snow, 1984). However, no studies investigate the link between standalone/portfolio strategy and individual alliance/portfolio alliance capability to study firm performance. The purpose of my research is to address this gap by studying alliance strategy, alliance capability and firm performance together. How does alliance capability help the firm to successfully implement a standalone or a portfolio strategy?

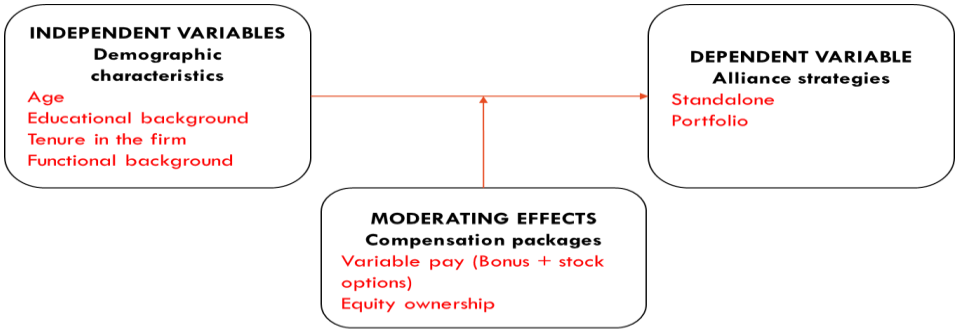
1.2. Thesis Structure

My thesis is formed of three papers. I propose and develop three conceptual models into three papers to address the research gaps and to explore how alliance strategy, alliance diversity and alliance capability influence firm performance. In my first paper, I explain the differences between a standalone strategy and a portfolio strategy when managing multiple alliances. I answer the question on why firms have a specific alliance strategy by studying the antecedents leading to the choice of either a standalone or a portfolio strategy. Based on upper echelons theory, managerial characteristics can influence the choice of alliance strategy, I investigate whether age, educational background, tenure and functional roles influence the choice of alliance strategy. For example, a portfolio strategy is considered as being less risky than a

standalone strategy because it takes into account the implications of potential conflicts among different alliances and allows the optimisation of alliance combinations. I hypothesise, for example, that older managers are more risk averse and may be more inclined to a portfolio strategy over a standalone strategy.

In addition, agency theory suggests that managers do not always behave in the best interests of a firm due to the pursuit of personal gains and objectives that may be different from the firm's (Jensen and Meckling, 1976). Compensation package and equity ownership are often used as control mechanisms to align the interests of the principal and the agent (Fama and Jensen, 1983). This implies that compensation and equity ownership can influence a top manager's strategic behaviour. Based on agency theory, I explore how compensation and equity ownership may lead top managers to deviate from the expected choice of alliance strategy. The conceptual model of paper 1 is shown in Figure 1-1 below:

Figure 1 - 1: Conceptual model of paper 1



In the second paper, I focus on the relationship between alliance diversity and firm performance. Alliance diversity has been studied mainly from the perspectives of

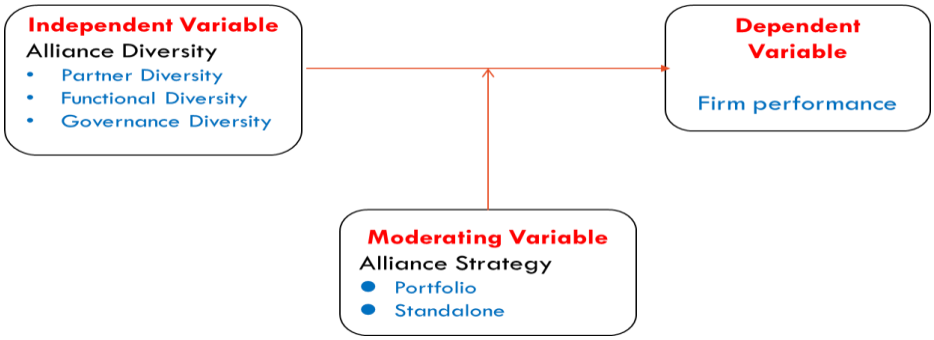
the resource-based view (e.g. Cui and O'Connor, 2012, Jiang et al., 2010) and social network theory (e.g. Gulati et al., 2000, Lavie and Miller, 2008). Drawing on the resource-based view, scholars argue that a firm's alliance diversity enables firms to access different resources and capabilities. However, studies on the relationship between alliance diversity and firm performance tend to be mixed. For example, some scholars find that partner diversity can lead to better firm performance (e.g. Beckman and Haunschild, 2002, Wuyts and Dutta, 2014), while others show that partner diversity can have negative effects on firm performance (e.g. Faems et al., 2010).

Similarly, from a social network theory perspective, results are somewhat different, as some scholars argue that alliance diversity is helpful toward learning and knowledge accumulation of alliance experience (e.g. Kale and Singh, 2007, Lavie and Miller, 2008) and tends to positively contribute to performance (e.g. Goerzen and Beamish, 2005, Lee, 2007, Powell et al., 1996, Phelps, 2010), while others show that alliance diversity may have a negative impact on performance when there is radical environmental change (Koka and Prescott, 2008).

Given the different findings regarding the impact of alliance diversity on firm performance in the literature, I explore the effect of alliance strategy on diversity and performance relationship. I draw on the resource-based view to argue that the impact of alliance diversity on firm performance may change depending on whether a firm

chooses a standalone or portfolio alliance strategy. A standalone strategy may not encourage managers to re-combine the resources from diverse partners, as each alliance is managed independently from each other. In contrast, for firms that adopt a portfolio strategy, diversity may be better leveraged, because a portfolio strategy encourages managers to evaluate all alliances based on a firm's overall corporate objectives rather than on individual alliance objectives. Therefore, I theorise that a portfolio strategy strengthens the relationship between alliance diversity and firm performance, while a standalone strategy weakens this relationship. The conceptual model of paper 2 is shown in Figure 1-2 below:

Figure 1 - 2: Conceptual model for paper 2

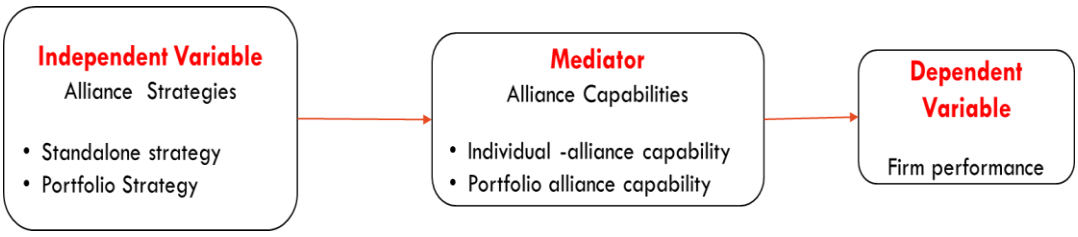


My third paper seeks to extend on the literature discussing alliance capability and firm performance. Scholars argue that firms may have different capabilities to manage their alliances, which leads to different performance outcomes (Anand and Khanna, 2000, Gulati, 1998, Kale et al., 2002). In investigating the effects of alliance capability on firm performance, scholars have identified a number of alliance capabilities. For example, Schreiner et al. (2009) note that firms need to have the

capability to coordinate partner-related activity and the capability to communicate with the alliance partner, as well as the capability to bond with their alliance partner. Kandemir et al. (2006) suggest that firms need to have the capability to coordinate across different alliances as well as the capability to learn from previous alliances.

In general, alliance capability studies either focus on the alliance capability to manage individual alliances (Simonin, 1997, Schreiner et al., 2009) or the alliance capability to manage a portfolio of alliances (Kandemir et al., 2006, Schilke and Goerzen, 2010, Sarkar et al., 2009). There are no studies that attempt to bring the two kinds of alliance capabilities together to study firm performance. Furthermore, the link between different alliance capabilities and different alliance strategies has so far not been explored. Although numerous studies note the relationship between alliance capability and performance, none of them take into account the role of alliance strategy in the equation. Drawing on the resource-based view, I propose that alliance capability may determine the outcome of alliance strategy. In other words, alliance capability can mediate the effect of alliance strategy on firm performance. The conceptual model for paper 3 is shown in Figure 1-3 below:

Figure 1 - 3: Conceptual model for paper 3



1.3. Expected Contribution of Research

The expected contributions of my research are as follows. First, previous literature suggests that firms may adopt two kinds of alliances strategies, such as portfolio strategy and standalone strategy (Ozcan and Eisenhardt, 2009, Hoffmann, 2007, Parise and Casher, 2003), but does not show what drives the choice of alliance strategy. I contribute to the alliance literature by exploring the factors leading to the choice of alliance strategy. I suggest that top managers' demographic backgrounds may determine the choice of alliance strategy. In addition, I propose that top executives' compensation packages may change the effect of managerial characteristics on alliance strategy. Although managerial background influences top managers' strategic choices (Hambrick and Mason, 1984), when taking compensation packages into account, the relationship between top executives' characteristics and alliance strategy is likely to change because different compensation packages may encourage different strategic decision-making behaviours. For example, a higher level of variable pay may encourage short-termism, which may impact the relationship between managerial characteristics and the choice of alliance strategy.

Second, the impact of alliance diversity on performance has been a matter of debate, as scholars have differing research outcomes. I contribute to the alliance diversity debate by providing an alternative explanation of the 'alliance diversity–firm

performance' relationship. I propose that the choice of alliance strategy can affect the relationship between alliance diversity and firm performance. Specifically, a standalone strategy may undermine the benefits of having diversity in the alliances as each alliance is dealt with independently from other alliances. A portfolio strategy enables a firm to leverage its alliance diversity because all alliances are managed collectively and top managers ensure that the mix of alliances is suitable for the portfolio. The different underlying nature of these alliance strategies means that choosing one strategy or the other may influence the way diversity impacts firm performance.

Third, I contribute to the alliance capability literature by highlighting that a firm needs appropriate alliance capability to better implement its alliance strategy. Previous literature discussing alliance capability notes that alliance capability has effects on alliance success and outcomes (Heimeriks and Duysters, 2007, Hoang and Rothaermel, 2005, Sarkar et al., 2009, Schilke and Goerzen, 2010). However, we know little about the effects of different types of alliance capability on different alliance strategies and firm performance. Although scholars note that the capability to manage alliances as independent entities is different from the capability to manage a portfolio of alliances (Wang and Rajagopalan, 2015), we do not know how these capabilities are different from each other and how different capabilities may impact on firm performance

differently. Therefore, I distinguish individual alliance capability from portfolio alliance capability and suggest that a standalone strategy will require individual alliance capability and a portfolio strategy will require *both* individual alliance capability and portfolio alliance capability in order to achieve greater performance. In other words, individual alliance capability mediates the relationship between alliance strategy (both standalone and portfolio strategies) and firm performance. Portfolio alliance capability mediates the relationship between portfolio strategy and firm performance.

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II. DO FIRMS REALLY HAVE ALLIANCE STRATEGIES?

2.1. Introduction

Strategic alliances have proliferated over the past thirty years, and in recent years firms have engaged in multiple strategic alliances (Gulati and Singh, 1998, Lavie, 2007). Competition and the urgent need for product innovation have made interfirm collaborations a critical component of many firms' strategy, as many rely on alliances to pool resources together in order to complement their innovation efforts (Deeds and Rothaermel, 2003, Faems et al., 2010). Research has shown that strategic alliances enable firms to acquire critical resources and capabilities, gain legitimacy and achieve a shorter innovation timespan and higher performance (Baum et al., 2000, Pisano, 1990, Powell et al., 1996, Shan et al., 1994, Teece, 1992). Scholars have also demonstrated the benefits of strategic alliances in a wide range of settings, such as international entry modes, start-up entrepreneurial founding, relational rent generation and incumbent advantage from complementary assets (Brouthers et al., 2014, Dyer and Singh, 1998, Nakos et al., 2014, Rothaermel, 2001b, Shan et al., 1994). Despite this, it is also known that strategic alliances have a high failure rate, with studies showing that 50% of alliances fail (Greve et al., 2010, Park and Ungson, 2001).

When a firm considers alliances as standalone occurrences, it appears to possess independent strategies for each alliance, thereby having a clearer goal on what it

intends to achieve from each collaboration. These individual collaborations are an important source of resources, capabilities and learning and thereby competitive advantage (Ireland et al., 2002). The resource-based view suggests that firm performance is contingent to firm resources and that differences in performance are related to variations in firms' resources (Hitt et al., 2000). Therefore, firms form alliances to overcome resource deficiencies and build competitive advantage by obtaining valuable, rare and imperfectly imitable resources from these individual strategic alliances (Barney, 1991, Das and Teng, 2000).

In contrast, a small number of studies suggest that firms do not consider strategic alliances as standalone entities. Firms take an alliance portfolio view, and managers make decisions by taking into account the strategic implications across a portfolio of alliances (Hoffmann, 2007, Ozcan and Eisenhardt, 2009). An alliance portfolio is a firm's collection of direct alliances with partners (Bae and Gargiulo, 2004, Baum et al., 2000, Hoffmann, 2005, Hoffmann, 2007, Lavie, 2007, Parise and Casher, 2003). An alliance portfolio can consist of several partners from different stages of the value chain, from different industries, countries and markets, as well as from an ensemble of firm alliances (Goerzen and Beamish, 2005, Gulati, 1998, Jiang et al., 2010, Lavie, 2007, Wassmer, 2010).

The portfolio concept was first developed in finance and demonstrates

quantitatively how portfolio selection works to reduce the risk of investment so that investors can choose the optimal investment combination (Markowitz, 1952, Markowitz, 1991). An investment portfolio can be defined as a collection of assets held by an investor, which can be stocks, bonds, deposits, treasury bills and real estate. The purpose of a portfolio is to reduce risk through diversification. The central theme of the portfolio theory is that for any given expected return, rational investors will prefer low-risk investment combinations; for any given level of risk, rational investors will prefer a higher return to a lower return from the investment combination. Investors make decisions that reflect their risk propensity and how they view the expected returns of an investment. In theory, an investor will not take increased risk without being compensated by an adequate increase in expected returns (Markowitz, 1952, Markowitz, 1991).

The portfolio perspective adopted in the strategic alliance strategy is that top managers make decisions about the selections of alliances in a portfolio. This reflects top managers' views on the expected returns and risk level for individual alliances as well as the entire portfolio. The strategies to design and manage an entire alliance portfolio appear to be relevant to portfolio diversification and risk. Top managers need to decide on a firm's direction for diversification as well as choosing alliances which they believe to have low risk in the firm's overall portfolio and provide the optimal

combination for their portfolio. Scholars have discussed that firms use a number of alliances to pursue multiple goals, enabling them to spread risk, overcome uncertainty and obtain greater overall portfolio benefits (George et al., 2001, Hoffmann, 2007). Scholars have also shown the effects of alliance portfolio diversity with regard to innovation and productivity, and highlighted that firms' use of the alliance portfolio approach can optimise their alliances combination, contributing to firm performance outcome (Cui and O'Connor, 2012, De Leeuw et al., 2014, Duysters et al., 2012, Hoffmann, 2005, Jiang et al., 2010, Parise and Casher, 2003, Sarkar et al., 2009, Vassolo et al., 2004).

Furthermore, strategic alliances create synergistic effects. These effects are the interactions between two or more entities that produce an effect greater than the sum of their individual effects. These effects can be advantageous to the firm, because through different alliances the firm may increase its market power, spread risk, share resources, and gain scope of economies and learning spill-overs from its alliances. Although both the standalone and portfolio alliance strategies may have this effect, it appears to be greater with the portfolio alliance strategy as it takes into account all alliances within a portfolio (Parise and Casher, 2003, Vapola et al., 2010, Vassolo et al., 2004).

For example, firms in the technology sector would often establish alliances to

meet market demands and adjust their portfolio of alliances for market uncertainty by terminating certain partnerships (Ozcan, 2017). Firms tend look for partners that can provide complementary resources because firms are unlikely to have all required capabilities and resources in house (Ozcan and Eisenhardt, 2009) but they may also need to terminate inefficient or low-performing partnerships (Ozcan, 2017).

Using a portfolio alliance strategy enables managers to assess potential partners effectively as well as evaluating current partnerships. They aim to see how these partnerships together can create synergies which impact or add value to firms' overall alliance portfolios (Ozcan and Eisenhardt, 2009, Ozcan, 2017). For example, firms with strong product innovation capabilities may seek partnerships with firms having strong market channels to distribute their products and acquire market knowledge from these partnerships. Essentially, executives who make decisions on the partnerships would consider their existing partnership base and the resource gaps they need to fulfil. When they can combine strong product capabilities with strong marketing channels with either their existing or new partnerships, they create unique synergies which can be used and applied to different products and markets. Another important advantage is that they are less likely to build redundant partnerships, and increase efficiency in partnership formation.

Using either standalone or portfolio alliance strategy, firms may be able to build

competitive advantage and improve firm performance (Baum et al., 2014, Christoffersen, 2013, Christoffersen et al., 2014, Hagedoorn and Schakenraad, 1994, Lin et al., 2009, Nakos et al., 2014, Shah and Swaminathan, 2008, Stuart, 2000). The differences are likely in the variations of performance outcomes. The question is: Which of the two strategies do firms tend to have? Do firms really have a portfolio alliance strategy before developing their alliance portfolio? Do firms simply formulate strategies according to each individual alliance on an ad hoc basis? Although a growing body of research has begun to explore the alliance portfolio perspective and has so far focused on the emergence, configuration and management of an alliance portfolio (Wassmer, 2010), to date, little empirical research has explored and distinguished firms' tendency to adopt the two different strategies.

To address this research gap, I draw on insights from the upper echelon theory and agency theory to investigate the alliance strategies that top executives adopt. The upper echelon theory and agency theory serve as appropriate guides because both focus on top executives. The upper echelon theory argues that a firm's strategy is the reflection of the values and cognitions of its top executives (Hambrick and Mason, 1984). Agency theory suggests that the agent is supposed to act for the benefit of the principal (Eisenhardt, 1989, Jensen and Meckling, 1976, Mitnick, 1973, Ross, 1973, Shapiro, 2005). The key insight of agency theory is that the agent will not always act

in the best interest of the principal, hence the principal establishes appropriate incentives for the agent and designs a monitoring system to ensure the agent's behaviour (Jensen and Meckling, 1976).

In this paper, I develop and test a theory in relation to the potential influences of demographic characteristics – namely the age, educational background, tenure in the firm and functional background of top managers – on the choice of firm alliance strategy, i.e. standalone or portfolio alliance strategies. I hypothesise that older mangers tend to choose a portfolio alliance strategy as they tend to have a more risk-averse stance. A portfolio alliance strategy allows top managers to receive benefits from engaging in multiple simultaneous alliances, which enables them to spread potential risks and better manage uncertainties (Hoffmann, 2007). I also theorise that managers with a higher level of education tend to choose the portfolio alliance strategy because higher levels of education equip top managers with better information processing skills, a better knowledge base and the ability to formulate better solutions (Bantel and Jackson, 1989, Hambrick and Mason, 1984, Michel and Hambrick, 1992, Tihanyi et al., 2000, Wiersema and Bantel, 1992). This makes them more likely to see the benefits of the portfolio alliance strategy. Regarding tenure in the firm, my hypothesis is that top managers with a shorter tenure in the firm may choose the standalone strategy because they appear to have limited firm knowledge and possibly

inadequate social capital (Hambrick and Fukutomi, 1991). This implies that short-tenure managers may be incapable of matching internal resources with external opportunities. Furthermore, I hypothesise that different functional roles will choose alliance strategies differently. Two types of functional roles are output and throughput (Hambrick and Mason, 1984). Managers with output functional roles – marketing, sales and product research and development – tend to pursue new market opportunities; they may choose the standalone alliance strategy as they are more likely to be opportunity oriented. In contrast, managers with throughput functional roles – production, engineering and accounting – may consider a firm's overall efficiency in terms of capabilities and resources available, and may choose the portfolio alliance strategy in order to formulate optimal combinations of alliances.

I further explore top managers' compensation packages and equity ownership in the firm as two moderating influences to see whether this correlates with top managers' choice of the strategic alliance strategy. Compensation packages and equity ownership are often used as incentive mechanisms to influence top managers' behaviour and align the interests of the principal and the agent (Fama and Jensen, 1983, Jensen and Meckling, 1976). Evidence from previous literature shows that these incentive mechanisms seem to have different or even opposite effects due to their asymmetrical risk propensities (Devers et al., 2007, Sanders, 2001, Sanders and

Hambrick, 2007, Wiseman and Gomez-Mejia, 1998).

Scholars have shown that incentive pay enables firms to align the interests of top managers and shareholders by discouraging risk-averse and opportunistic behaviour (Devers et al., 2007). It also appears to be relevant to firms' strategies (Balkin et al., 2000, Carpenter and Sanders, 2002, Carpenter et al., 2003, Cho and Shen, 2007). Top managers' compensation often includes two parts: fixed pay – salary; variable pay – bonus, incentives, profit-sharing and stock options. I hypothesise that the relationship between top managers' background characteristics (age, educational background, tenure in the firm and functional roles) and their choice of alliance strategy is moderated by the proportion of variable pay because a higher proportion of variable pay encourages managers to take riskier decisions and emphasise short-term gains (Guidry et al., 1999). The effect of this moderating influence is that top managers will tend to choose the standalone strategy rather than the portfolio strategy, and managers with the tendency of choosing a standalone strategy are even more likely to choose the standalone strategy.

Scholars have also suggested that the agency issue occurs when top managers or key decision-makers have no financial interests in the outcome of their decisions (Boyd, 1995, Boyd, 1994, Fama, 1980, Fama and Jensen, 1983). Therefore, I hypothesise that the relationship between top managers' background characteristics

(age, educational background, tenure in the firm and functional roles) and their choice of alliance strategy is moderated by the proportion of equity ownership, as a higher proportion of equity better aligns managers' future financial outcomes with shareholders' outcomes (Nyberg et al., 2010). This implies that a higher proportion of equity ownership is likely to encourage managers to make decisions based on the long-term prospects of the firm. In addition, the portfolio strategy allows firms to spread risk and overcome uncertainty (Hoffmann, 2007, Wassmer, 2010). Therefore, top managers will tend to choose the portfolio strategy instead of the standalone strategy, and managers with a large proportion of equity are even more likely to choose the portfolio strategy.

This research makes several contributions. Firstly, the study investigates the key demographic characteristics of Chief Executive Officers (CEOs), which may have deterministic effects on their firm's choice of strategic alliance strategy. Previously, scholars have identified the relationships between top managers' demographic characteristics and various strategic choices such as strategic alliance formation, international involvement and international partnership (Eisenhardt and Schoonhoven, 1996, Reuber and Fischer, 1997, Sambharya, 1996). Thus far, no theoretical or empirical work has appeared to study the strategic choice of alliance strategy. By linking top managers' background and firms' strategic alliance strategy, this study aims

to provide further insights into the current literature in the field. This is important because strategic alliances are a common practice in firm strategy, and top managers' choices and actions regarding strategy are likely to have an impact on the organisation (Hambrick et al., 2005). In addition, past literature on strategic alliance and alliance portfolio has seemed to assume that firms adopt one of the two strategies. Therefore, this study contributes to this important issue of managers' intentions and tendency in choosing strategic alliance strategies.

Secondly, one important aspect of agency theory is to align the interests of the principal and the agent. However, the financial alignment argument seems unsettled and inconclusive. A few meta-analyses have reported some contradictory or weak alignment relationships (Dalton et al., 2003, Devers et al., 2007, Tosi et al., 2000). Only one recent study demonstrated empirically that the financial alignment between shareholder return and CEO return are substantially supported (Nyberg et al., 2010). Developing and testing the two moderating influences – i.e. incentive pay and equity ownership – allows us to further advance and understand the effects of these financial alignment mechanisms on managers' behaviour.

In the following section, I discuss the theory and hypotheses underlying my analysis, and illustrate the theoretical model of strategic alliance strategies integrating upper echelon and agency theories. I then discuss the research design, followed by the

empirical results. A final section concludes by discussing the managerial and theoretical implications of this research.

2.2. Theory and Hypotheses

Strategic alliances have become an important strategic device for firms to access crucial resources, and are an essential part of firm strategy (Ireland et al., 2002, Parise and Casher, 2003, Wassmer, 2010). They enable firms to manage risk and uncertainties (Hoffmann, 2007). However, research indicates that firms still suffer from a high failure rate of strategic alliance – 50% of strategic alliances still fail (Greve et al., 2010, Park and Ungson, 2001).

Over the past few decades, researchers have tried to explain how firms can create successful strategic alliances and contribute to firm performance (Ahuja, 2000a, Ahuja, 2000b, Anand and Khanna, 2000, Baum et al., 2000, Chung et al., 2000, Doz, 1996, Dussauge et al., 2000, Eisenhardt and Schoonhoven, 1996, Gulati, 1995a, Gulati, 1995b, Gulati, 1998, Gulati and Singh, 1998, Hitt et al., 2000, Parkhe, 1993, Simonin, 1997, Stuart, 2000). However, in today's business landscape, firms are commonly engaged in multiple alliances, not just single alliances. They are facing challenges in managing a portfolio of strategic alliances (Anand and Khanna, 2000, Doz and Hamel, 1998, Gulati, 1998, Hoffmann, 2005, Hoffmann, 2007, Lavie, 2006, Lavie, 2007, Lavie and Miller, 2008, Ozcan and Eisenhardt, 2009, Parise and Casher, 2003).

Researchers have started to explore the benefits and cost of viewing a firm's alliances as a portfolio. They have suggested that adopting a portfolio alliance strategy may be more beneficial as it allows the firm to create value through recombining resource-based advantages from different alliances and to better utilise synergistic effects from different alliances (Doz and Hamel, 1998, Hoffmann, 2005, Hoffmann, 2007, Kale et al., 2002, Parise and Casher, 2003, Powell et al., 1996, Vassolo et al., 2004).

Most studies that examine strategic alliances and alliance portfolios have investigated these two strategies independently (Hoffmann, 2007, Parise and Casher, 2003, Wassmer, 2010) and concentrated on the cost and benefits of either standalone alliance strategy or alliance portfolio strategy. A few scholars highlight that firms' top managers and top management teams affect the formation of alliances, the assessment of technological alliance opportunities and the creation of high-performing alliance portfolios (Eisenhardt and Schoonhoven, 1996, Ozcan and Eisenhardt, 2009, Tyler and Steensma, 1998). Eisenhardt and Schoonhoven (1996) report that top management team members' previous work experiences and the level of their previous jobs affect the rate of alliance formation. Their results show that firms with top management team members who had previously worked for many semiconductor firms and have had higher levels of management positions have significantly higher rates of alliance formation. Tyler and Steensma (1998) note that top executives' experiences and

perceptions affect their assessment of potential technological alliances. Their studies showed that age, technical education, technical work experience and past successful collaboration experience were all directly related to top executives' assessment of potential technological alliances.

Moreover, Ozcan and Eisenhardt (2009) provide two important insights that are related to top executives when originating their alliance portfolio. The first is that if executives are able to visualise their firm's portfolio in the context of the entire industry, they are more likely to create a high-performing portfolio. The second is that executives make the strategic choice to form multiple ties simultaneously, which is more likely to result in a high-performing portfolio than as in executives who form a series of individual ties. Empirical evidence to date still does not distinguish firms' tendency to choose one alliance strategy over another; rather, it appears to ignore the managerial characteristics that determine the choice of firm alliance strategies. There is a need to explore and distinguish firms' tendency to adopt and choose certain alliance strategies, i.e. standalone or portfolio. Although many studies have suggested that strategic alliances contribute to firm performance because it enables the firm to access valuable resources and overcome resource constraints – e.g. technological know-how and capabilities, complementary assets and legitimacy (Baum et al., 2000, Brouthers and Nakos, 2004, Brouthers et al., 2014, Dyer and Singh, 1998, Pisano,

1990, Shan et al., 1994, Teece, 1992) – none have considered the factors that determine managers' choice of the standalone strategy or the portfolio strategy. Instead, scholars have often investigated the formation, structure and performance of strategic alliances (Ahuja, 2000b, Anand and Khanna, 2000, Ariño, 2003, Eisenhardt and Schoonhoven, 1996, Gulati, 1998, Lavie and Rosenkopf, 2006, Parkhe, 1993, Stuart, 2000), and the emergence, configuration and management of alliance portfolios (Hoffmann, 2007, Wassmer, 2010) rather than managerial effects on the choice of alliance strategy.

In addition, recent studies highlight that firms are increasingly engaged in multiple alliances (Hoffmann, 2005, Hoffmann, 2007, Li et al., 2012, Wassmer, 2010), and managing their alliances as a portfolio seems to achieve greater synergistic effects, contributing to better firm performance (Lavie, 2007, Lavie and Miller, 2008, Lavie and Singh, 2012). Both the standalone and portfolio alliance strategies seem to have some degree of performance effect, but the decision to choose either the standalone strategy or the portfolio strategy rests with firms' top managers. The factors that determine managers' choice of portfolio strategy have also not been clearly identified in the literature. Because of this, it is important to investigate both alliance strategies concurrently to gain a better understanding of top managers' tendency to adopt one alliance strategy or the other. I incorporate two theoretical perspectives – the upper echelons theory and agency theory – in order to analyse top executives' strategic

choice of alliance strategy. This is because the upper echelons theory may determine the choice of alliance strategy, and agency theory is likely to strengthen the upper echelon theory's predictions of top managers' alliance strategy.

The core of the upper echelons theory suggests that executives base their decision-making on their personal interpretations. These personalised interpretations are built up from their experiences, value and perceptions (Hambrick and Mason, 1984, Hambrick, 2007). In order to understand a firm's strategy, we must understand the top executives. Hambrick (2007 p:334) note that 'If we want to understand why organizations do the things they do, or why they perform the way they do, we must consider the biases and dispositions of their most powerful actors – their top executives'. The upper echelon theory has been used in many studies to examine the attributes of top managers, top management teams and their influences on firms' strategy and performance (Buyl et al., 2011, Carpenter et al., 2004, Carpenter and Fredrickson, 2001, Certo et al., 2006, Finkelstein and Hambrick, 1990, Hambrick and Quigley, 2014, Tihanyi et al., 2000, Wiersema and Bantel, 1992). In my research, the alliance strategy is an important firm strategy which may influence firms' future directions and long-term prospects. This theory focuses on top executives and is appropriate for analysing how top executives make strategic choices for their firm's alliance strategy.

The agency theory suggests that top executives (the agent) are often motivated by self-interest, are rational and tend to be risk averse. Shareholders and company owners (the principal) may use incentive schemes to align the interests of the principal and agent (Eisenhardt, 1989, Jensen and Meckling, 1976). Eisenhardt (1989) suggests that it is appropriate to use agency theory to examine the compensation schemes of top executives. Moreover, agency theory focuses on the possible factors that may influence top executives' behaviour. Based on this theoretical framework to investigate the incentive mechanisms that may influence top executives' strategic choice of alliance strategy, this study provides further insights on the use of incentive mechanisms and how these may strengthen or weaken top executives' choice of alliance strategy.

Drawing on both the upper echelon theory (Hambrick and Mason, 1984) and agency theory (Jensen and Meckling, 1976), I firstly develop a theory to suggest that the tendency of choosing an alliance strategy is determined by top executives' background characteristics. Secondly, I argue that the choice of alliance strategies can be influenced by top managers' compensation package in the firm, such as variable pay and equity ownership – two incentive mechanisms that are commonly used to align the interests of top managers and shareholders (Boyd, 1994, Carpenter and Sanders, 2002, Chng et al., 2012, Datta and Iskandar-Datta, 2014, Devers et al., 2007,

Nyberg et al., 2010, Pandher and Currie, 2013, Sanders and Hambrick, 2007).

2.2.1. Managerial Characteristics and Alliance Strategies

In their seminal work on the upper echelons perspective, Hambrick and Mason (1984) argue that a firm's outcome, such as its strategies and effectiveness, is a reflection of the value and cognitive bases of its top managers. They suggest that observable managerial characteristics such as age, tenure in the firm, educational background, functional background and other demographic characteristics can be used to predict managers' behaviour in making strategic choices, and that these are reflected in strategic outcomes. A number of subsequent studies provide evidence supporting the upper echelons perspective and highlighted that managerial characteristics are indeed related to firms' strategic choice and managers' decision-making processes (Bantel and Jackson, 1989, Brouthers et al., 2000, Carpenter and Fredrickson, 2001, Chaganti and Sambharya, 1987, Certo et al., 2006, Herrmann and Datta, 2002, Herrmann and Datta, 2006, Hitt and Tyler, 1991, Pegels et al., 2000, Smith et al., 1994, Wiersema and Bantel, 1992).

Research appears to suggest that managerial characteristics are important to predict firms' strategic choices as well as different strategic scenarios. For example, Hitt and Tyler (1991) note that managers' age, educational level, work experience and managerial levels influence their strategic decision formulation. Brouthers et al. (2000)

provide empirical support that managerial characteristics (e.g. age, experience, education and risk propensity) are all important predictors of strategic aggressiveness.

Scholars have presented insights into how managers' characteristics may impact firms' strategic choices and decision-making in different strategic settings. However, one important strategic scenario remains undocumented – firms' alliance strategy; in particular, how different managerial characteristics may affect managers' choice on a firm's alliance strategy. Top managers' choice of firm alliance strategy is likely to affect the outcome of a firm's alliance operation and its outcome. The two different strategies – standalone and portfolio strategies – inherently produce different synergistic effects and risk propensity (Parise and Casher, 2003, Wassmer, 2010). The two strategies are likely to require different industry knowledge and networks as well as top executives' professional experience (Bae and Gargiulo, 2004, Baum et al., 2000, Ozcan and Eisenhardt, 2009). These requirements are reflected in top managers' background characteristics, hence the different demographic characteristics of top managers may be able to predict managers' alliance strategy and allow us to better understand the tendency of top managers' choice in firms' alliance strategy.

In this paper, I argue that managerial characteristics influence how standalone and portfolio alliance strategies are perceived and adopted. In particular, I contend that the attributes of a top manager are likely to have a significant influence on firm alliance

strategy. As key decision-makers, top managers have the power and ability to make decisions that are likely to influence the firm's outcomes (Hambrick and Fukutomi, 1991, Hambrick and Mason, 1984). I incorporate the four main characteristics – namely age, educational background, functional background and tenure in the firm – to develop hypotheses that link to the two alliance strategies.

2.2.1.1. Age

Age has been investigated in various strategic decision-making studies and demonstrated as an important variable that relates to strategic choice and different strategic scenarios. Studies have noted that young and old managers are likely to make different strategic choices due to managers' risk-taking propensities (Bantel and Jackson, 1989, Hambrick and Mason, 1984, Wiersema and Bantel, 1992). Hitt and Tyler (1991) found that age had a moderating effect between objective selection criteria and merger decisions. Wiersema and Bantel (1992) note the age effect on strategic changes is that older managers are less likely to make strategic changes compared to younger managers. Tyler and Steensma (1998) found that potential technological alliances were less attractive to older managers. Brouthers et al. (2000) found the relationship between entrepreneurial styles and strategic aggressiveness to be moderated by age, with older managers weakening the relationship. Matta and Beamish (2008) argue that CEOs approaching retirement are more risk averse and that

older managers tend to take fewer risks in the context of international acquisition.

In a more recent study relating to CEOs' career horizons (McClelland et al., 2012), the authors argue that younger CEOs with relatively long career horizons are more likely to adopt risky strategies in order to enhance future firm performance. Chief Executive Officers with shorter career horizons are more risk averse and more concerned about career security. Their finding shows that the relationship between CEO age and future return on assets changes when taking CEO equity ownership into account. They suggest that the highest future firm performance is linked to young CEOs with low equity ownership.

Scholars seem to agree that age has an impact on firm strategy, and that older managers tend to be more conservative and risk-averse than younger managers. In addition, age seems to have an impact on decision-making scenarios. According to Hambrick and Mason (1984), there are three main explanations for the age effect on executives: mental and physical stamina (Child, 1974), commitment to maintaining the status quo (Hambrick et al., 1993), and views and positions on the importance of financial and career security (Matta and Beamish, 2008). All of these explanations are to some degree related to managers' risk-taking attitudes, and scholars have shown age and risk-taking to have a significant relationship (Vroom and Pahl, 1971). Many studies have also provided evidence on age and risk-taking behaviour of strategic

choice (Bantel and Jackson, 1989, Wiersema and Bantel, 1992).

If older managers are likely to take a less risky stance, I argue that they are more likely to choose a portfolio alliance strategy, because firm alliance strategies inherently have different risks and uncertainties (Das and Teng, 1998, Hoffmann, 2007). According to Das and Teng (1998), strategic alliances are associated with relational and performance risks. Hoffmann (2007) highlights four dimensions of strategic uncertainties that are perceived by senior executives: (1) regulative uncertainty, (2) technological uncertainty, (3) market uncertainty, and (4) competitive uncertainty. A portfolio alliance strategy seems to better manage and control these risks and uncertainties; it allows managers to spread different risks by choosing a combination of suitable alliance partners to overcome these risks and uncertainties (Hoffmann, 2007, Parise and Casher, 2003, Vassolo et al., 2004). Furthermore, a portfolio strategy is likely to be less risky than a standalone alliance strategy because the latter may only consider one specific risk or uncertainty at a time while a portfolio alliance strategy enables managers to consider different risk implications simultaneously.

In contrast, younger managers tend to take more risks and are more flexible to change (Bantel and Jackson, 1989, Carpenter et al., 2003, Wiersema and Bantel, 1992). Younger managers may have a more short-term orientation, i.e. short-termism. Short-termism is defined as ‘a preference for actions in the near term that have detrimental

consequences for the long term' (Marginson and McAulay, 2008). If younger managers are likely to take a more short-term stance to pursue short-term performance results, then they will choose a standalone alliance strategy.

I argue that younger managers are more likely to choose a standalone alliance strategy than older managers because this strategy may focus on a specific objective and is more likely to produce an outcome in a shorter time span. Furthermore, a standalone alliance strategy is likely to be riskier as it may consider risks associated with each alliance individually. A portfolio alliance strategy takes into account different alliances and the risk implications of the combination of different alliances. It tends to have longer-term implications than a standalone alliance strategy. Younger managers may be more willing to take riskier alliance strategies in order to have a quicker outcome to justify their performance without considering different types of risks and uncertainties associated with strategic alliances.

Taking these arguments together, the age effect is likely to impact the choice of firm alliance strategy, and different age cohorts may choose alliance strategies differently. Hence, Hypothesis 1 states:

> **Hypothesis 1 (H1)**: Older managers are more likely to choose a portfolio alliance strategy while younger managers are more likely to choose a standalone alliance strategy.

2.2.1.2. Educational background

Educational background has been viewed as an important variable for strategic decision-making, and it provides an indication of executives' knowledge and skill base (Brouthers et al., 2000, Hambrick and Mason, 1984, Wiersema and Bantel, 1992). Prior studies have shown that the educational background of top executives is related to decision-making (Bantel and Jackson, 1989, Tihanyi et al., 2000, Wiersema and Bantel, 1992). Scholars indicate the relevance of both the level of education and the type of education (Hitt and Tyler, 1991). In addition, top executives' educational profiles – elite education (i.e. whether they attended elite educational institutions) – appear to be relevant to firm strategy, because attending a prestigious school denotes an elite membership. This membership leads to external social ties which may provide new opportunities and resources (Cao et al., 2012, Ozgen and Baron, 2007).

Scholars demonstrate that the education effect occurred in different strategic decision scenarios, such as the adoption of innovation in banking, strategic change and international diversification (Bantel and Jackson, 1989, Tihanyi et al., 2000, Wiersema and Bantel, 1992). Bantel and Jackson (1989) found that more innovative banks were often managed by more educated managers. Wiersema and Bantel (1992) showed that firms most likely to undertake changes in corporate strategy often had more educated managers with academic training in sciences. Other scholars have examined the

relationship between elite education and executive behaviour (Palmer et al., 1993). In particular, Tihanyi et al. (2000) demonstrated that higher levels of international diversification were associated with elite educational backgrounds.

Studies have suggested that higher levels of education are likely to influence strategic decision-making (Brouthers et al., 2000, Grimm and Smith, 1991, Hambrick and Mason, 1984). This is because higher levels of education facilitate the development of cognitive ability and more educated executives possess greater cognitive complexity (Hitt and Tyler, 1991, Wally and Baum, 1994). Also, managers with higher levels of education may be equipped with enhanced information-processing and analytical skills (Papadakis et al., 1998, Wiersema and Bantel, 1992). Carpenter and Fredrickson (2001) show that managers with high levels of education tend to have more expansive global strategic posture.

However, Hitt and Tyler (1991) found no moderating effect of education level between the relationship of objective criteria and the strategic evaluation of acquisition candidates. Brouthers et al. (2000) also found no moderating effect of education level between environmental factors and strategic aggressiveness. Herrmann and Datta (2002) found no support between educational level and entry-mode choice. The effect of educational level seems to have inconclusive results. This may be because senior managers complete their formal education many years before they reach their

positions, so education level may not play an important role in certain strategic decision-making scenarios (Finkelstein and Hambrick, 1996, Shenkar and Zeira, 1992).

Scholars have also shown that type of degree affects strategic choice (Hitt and Tyler, 1991, Tyler and Steensma, 1998), managerial orientation towards Research and Development (R&D) funding (Barker and Mueller, 2002, Tyler and Steensma, 1998) and a firm's decision on environmental disclosure (Lewis et al., 2014). Hitt and Tyler (1991) found that the type of education is a significant moderator between objective criteria and the evaluation of targeting a firm on the strategic acquisition decision. Tyler and Steensma (1998) found that executives with a technical educational background (i.e. engineering and chemistry) assess potential technological alliances more favourably than executives with other educational backgrounds. Barker and Mueller (2002) demonstrate that number of science/engineering degrees achieved by a top executive is associated with R&D spending, but the number of business degrees has no association with higher R&D spending and a legal degree has a negative association. Lewis et al. (2014) note that CEOs with a Master of Business Administration (MBA) are more likely to respond to institutional pressure and disclose environmental information; CEOs who are lawyers are less likely to respond and disclose such information.

Furthermore, elite education may be an important indicator of top executives' social capital (Cao et al., 2012, Kish-Gephart and Campbell, 2014, Ozgen and Baron, 2007), which may influence their strategic choice. Graduating from a prestigious university may indicate social status and provide links to various ties and opportunities (Granovetter, 1973, Tiwana, 2008). These ties can be unique external resources that facilitate alliance formation (Gulati, 1998).

According to Hambrick and Mason (1984) and Wiersema and Bantel (1992), education indicates a person's knowledge and skill base, and reflects their cognitive ability. This suggests that level of education is likely to influence executives' choice of alliance strategy, because a higher educational level provides top executives with a broad knowledge base, and better analytical and decision-making skills (Hambrick and Mason, 1984). This skill set enables them to consider the costs and benefits of different alliances in a holistic way. The holistic concept is similar to 'the industry architectural view', where top managers formulate firms' combination of alliances in the context of the entire industry (Ozcan and Eisenhardt, 2009).

In regards to managerial capabilities, the standalone alliance strategy requires top executives to possess capabilities that are important to the management of individual alliances. This relates to the ability to search, negotiate, manage and terminate an individual alliance (Kale and Singh, 2009, Schreiner et al., 2009, Wang

and Rajagopalan, 2015). The portfolio alliance strategy requires top executives not only to possess the capabilities for the standalone alliance strategy, but also for the portfolio alliance capabilities, e.g. portfolio coordination capabilities (Sarkar et al., 2009, Schilke and Goerzen, 2010). In particular, the portfolio alliance strategy requires top executives to formulate alliances in the industrial context and evaluate synergistic effects created from the combination of the alliances (Hoffmann, 2007, Parise and Casher, 2003). These managerial capabilities can be reflected in top managers' cognitive ability and complexity, which are related to their levels of education.

Given that more highly educated managers develop better cognitive ability and complexity through their formal education (Brouthers et al., 2000, Hitt and Tyler, 1991), and the portfolio alliance strategy requires more complex managerial capabilities and skills, it is very likely that more highly educated managers choose the portfolio alliance strategy because they have more developed cognitive complexity in order to evaluate synergies from a combination of different alliances.

In contrast, less educated managers may not develop their cognitive complexity and the necessary capabilities through formal education. The standalone alliance strategy is simpler to manage than the portfolio alliance strategy, and it does not require such advanced cognitive complexity as the portfolio alliance strategy. Therefore, managers with a lower educational level may tend to choose the standalone

alliance strategy over the portfolio alliance strategy. Hypothesis 2a states:

> **Hypothesis 2a (H2a)**: Managers with a higher educational level are more likely to choose a portfolio alliance strategy, while managers with a lower educational level are more likely to choose a standalone strategy.

Wiersema and Bantel (1992) suggest that education specialisation shapes perspectives and outlooks. Executives with different types of education (i.e. subject areas they studied) may have different decision orientation or decision rules. Formal education in engineering may train managers to think using different cognitive models from those in business for strategic decision-making (Hambrick and Mason, 1984). For example, Tyler and Steensma (1998) highlight that science and engineering academic training provide a more complete knowledge of technology and innovation. Barker and Mueller (2002) argue that top executives with legal and business academic training may be less inclined to pursue innovation through R&D spending because of a lower emphasis on innovation in their training. Scholars also have found that top executives holding MBAs are more likely to use advanced accounting and budgeting techniques than executives without MBAs (Graham et al., 2005). It appears that business-related degrees are likely to have more training on evaluating risks and uncertainties. This may lead to a more conservative stance because the academic training teaches analytic skills which discourage risk-taking and prevent big losses

(Barker and Mueller, 2002).

The two strategic alliance strategies tend to require different perspectives on risks and uncertainties. For the standalone strategy, managers evaluate and manage risks and uncertainties related to a particular alliance, one at a time. For the portfolio strategy, managers need to evaluate risks and uncertainties related to multiple alliances in the portfolio and understand how to spread risks and uncertainties (Hoffmann, 2007, Parise and Casher, 2003, Vassolo et al., 2004, Wassmer, 2010).

Having specialised training in evaluating and calculating risks and uncertainties is likely to affect how an individual perceives and evaluates risks and uncertainties. Given that business-related subjects tend to teach how to avoid big risks and mistakes (Barker and Mueller, 2002), senior managers with formal training in business-related subjects are likely to take a less risky stance as they may have a better understanding of risk implication and be able to use the tools and knowledge gained from such training. This implies that they are more likely to choose the portfolio strategy as it allows them to better manage and spread risks and uncertainties.

In contrast, non-business-related subjects may not include adequate training in calculating and evaluating risks and uncertainties. Managers without such training may take a riskier stance because they may be less exposed to the concept of business risk and uncertainties. They may not have been trained to use advanced analytical tools,

e.g. accounting techniques. In addition, they may not even realise that there are different strategies to manage firm alliances. This implies their choice of alliance strategy may be limited to the standalone strategy. Hence, Hypothesis 2b states:

> **Hypothesis 2b (H2b)**: Managers with academic training in business are more likely to choose a portfolio alliance strategy, while managers with academic training in non-business are more likely to choose a standalone strategy.

Furthermore, an elite educational background provides the basis to develop a person's network, which can be the origin of executives' social capital (Cao et al., 2012). Executives graduating from elite schools are likely to have more diverse and valuable social capital than executives attending non-elite schools. Top executives with qualifications from elite schools may also have powerful friends. This can symbolise prestigious power (Finkelstein, 1992). The personal network built from attending an elite school enables executives to access a greater external resources and capabilities pool (Gulati et al., 2000). This provides more opportunities to have a variety of potential partners, which can be useful for alliance formulation and alliance portfolio planning.

Strategic alliances enable firms to access critical resources and capabilities (Baum et al., 2000, Brouthers et al., 2014). The standalone strategy may enable firms to access critical resources from those partners in a particular alliance when managing

one alliance at a time or on an ad-hoc basis. The portfolio strategy allows firms to simultaneously access a variety of different resources and capabilities from all partners in a firm's alliance portfolio (Kale and Singh, 2009, Lavie, 2006, Lavie, 2009, Parise and Casher, 2003). At the initial stage of alliance formation and alliance portfolio planning, partner selection is an important factor for the success of the alliance (Brouthers et al., 1998, Hitt et al., 2000). Partner diversity is likely to contribute to firm performance (Jiang et al., 2010).

Elite education enables executives to build their social capital and is likely to provide them with more alliance formation opportunities for portfolio planning (Gulati and Gargiulo, 1999b). It may also allow more access to relevant industrial information (Gulati, 2007). This enables executives to view the different opportunities available to them and the benefits of configuring them into their firm's alliance portfolio. This facilitates the planning and management of a firm's alliance portfolio. Therefore, I suggest that managers with an elite education are more likely to choose the portfolio strategy due to their external social capital, which presents them with more alliance opportunities. They are more likely to see the benefits of combining different opportunities to formulate their firm's alliance portfolio.

In contrast, non-elite-educated executives may lack the valuable social capital of those with an elite education. This is likely to put executives at a disadvantage when

formulating alliances because of fewer opportunities available to them. This implies that their alliance strategies may be constrained by a less prestigious network to utilise. As a result, their choice of alliance strategy is limited to the standalone strategy. Hence, Hypothesis 2c states:

> **Hypothesis 2c (H2c)**: Managers with an elite education are more likely to choose a portfolio strategy, while managers without such an education are more likely to choose a standalone strategy.

2.2.1.3. Tenure

Tenure has been associated with many firms outcomes, such as firm performance (Henderson et al., 2006, Luo et al., 2014, Miller, 1991), strategic choice (Hambrick and Fukutomi, 1991), strategic changes (Zhang and Rajagopalan, 2010), commitment to status quo (Musteen et al., 2006), innovation (Wu et al., 2005) and risk taking (Simsek, 2007). Hambrick and Fukutomi (1991) suggest that different phases of CEO tenure impact firm strategy and performance differently. They highlight that in the early stage of their tenures, CEOs are more open and willing to adopt risky decisions but that this may be constrained due to limited firm knowledge and inadequate social capital. Miller (1991) notes that long-tenured CEOs tend to avoid changing their strategies even if the environment requires such changes. Finkelstein and Hambrick (1990) found that top management teams with longer tenure also tend

to avoid strategic change. Simsek (2007) found that long-tenured CEOs tend to become risk averse.

Hambrick and Fukutomi (1991) found that an inverted U-shaped relationship exists between length of tenure and firm performance. This implies that there is an upward relationship between shorter tenure and firm performance followed by a downward relationship between longer tenure and performance. This suggests that short-tenured executives tend to perform better in the early stage of their tenure. Also, a few other studies have demonstrated that top executives' tenure has an inverted U-shaped relationship with profitability (Henderson et al., 2006), invention (Wu et al., 2005), market expansion (Souder et al., 2012) and entrepreneurial orientation (Boling et al., 2015). The inverted U-shaped relationships are due to the changes in top executives' cognitive paradigms over the course of their tenures (Hambrick and Fukutomi, 1991).

Also, scholars have suggested that a propensity towards risk-taking is likely to change over the course of a top manager's tenure (Simsek, 2007). This is because short-tenured managers may not yet have sufficient knowledge to assess strategic risks. Longer-tenured managers may have deeper knowledge about the firm and its environments and are likely to possess job-specific skills and be more capable of risk assessment (Wu et al., 2005, Simsek, 2007). This implies that the effects of tenure in

the firm are likely to affect their choice of alliance strategy.

Furthermore, tenure in the firm may affect top executives' legitimacy and the level of respect they receive from key external and internal stakeholders such as employees, shareholders, customers and alliance partners (Agle et al., 1999). For example, short-tenured managers may suffer from liability of newness. The term 'liabilities of newness is often used to describe the drawbacks of entrepreneurial firms' (Stinchcombe and March, 1965). To a large extent, it is also applicable to top executives when they only have a short tenure in the firm, because, similar to those in entrepreneurial firms, they may lack suitable resources and skills.

The choice of firm alliance strategy relies on top executives and their attitudes toward risks, job-specific skills and legitimacy, which are likely change or develop over the course of their tenures. The standalone alliance strategy may not be as superior as the portfolio strategy in the control and management of risk, because the portfolio strategy enables the spread of risks over different alliances (Hoffmann, 2007). In regard to job-specific skills for choosing firm alliance strategy, it is important that executives have adequate industrial knowledge so that they can establish their firm alliance portfolio in the context of their industry (Ozcan and Eisenhardt, 2009). Moreover, gaining legitimacy often requires time and the building of credibility with internal and external stakeholders (Suchman, 1995). For the standalone strategy,

executives may not require as much support from internal and external stakeholders. However, the portfolio alliance strategy needs much more support from both types of stakeholders because executives need to reconfigure resources and capabilities in order to build their alliance portfolio.

Short-tenured managers tend to have limited firm and industrial knowledge, limited job-specific skills and inadequate legitimacy from different stakeholders, but they are willing to take risks. They are more likely to choose a standalone strategy because this strategy may require less firm knowledge and job-specific skills. In addition, short-tenured managers may not yet have gained respect and legitimacy from key external and internal stakeholders and may lack important social capital both within and outside the firm. This may be disadvantageous for adopting a portfolio alliance strategy, because gathering different resources to formulate an alliance portfolio (Cui and O'Connor, 2012) may require support from key employees and stakeholders (Kale et al., 2001, Sundaramurthy et al., 2014).

In contrast, longer-tenured managers tend to have a deeper knowledge of the firm and its environments, and are likely to possess job-specific skills. They may be more capable of risk assessment and more likely to utilise different alliances to manage and control risks. In addition, they are also more likely to have established respect and legitimacy from internal and external stakeholders. This not only facilitates the

building of an alliance portfolio but is also beneficial at the early stage of alliance formation (Baum et al., 2000). Therefore, they are more likely to choose the portfolio alliance strategy. Hypothesis 3 states:

> **Hypothesis 3 (H3)**: Managers with shorter tenure are more likely to choose a standalone alliance strategy and managers with longer tenure are more likely to choose a portfolio alliance strategy.

2.2.1.4. Functional background

Functional background refers to executives' work experience within functional areas of firms (Waller et al., 1995). Prior studies suggest that executives' functional background influences their perceptions and further influences their strategic choice (Hambrick and Mason, 1984, Waller et al., 1995). Functional background has important implications for the knowledge, skills and cognitive orientation that top executives bring to their firms (Herrmann and Datta, 2006). Hambrick and Mason (1984) discuss that managers with different functional backgrounds are likely to have different attitudes, knowledge and perspectives when making different strategic choices. This is because functional background may influence how they identify business problems and formulate solutions (Herrmann and Datta, 2006).

Scholars suggest that functional background is associated with firm outcomes and managerial behaviour as well as strategic orientation (Bantel and Jackson, 1989,

Bermiss and Murmann, 2014, Brouthers et al., 2000, Geletkanycz and Black, 2001, Thomas et al., 1991). Bermiss and Murmann (2014) demonstrate that top executives carrying out different functional roles have different effects on firm survival. Executives who manage internal firm functions are more crucial to firm viability than executives who manage external relationships (e.g. account managers, media executives and creative directors). Brouthers and his colleagues (2000) report that functional experience moderates the relationship between environmental factors (i.e. environmental turbulence, entrepreneurial style and organisational structure) and strategic aggressiveness. In particular, they found that managers with accounting and finance experience are more likely to rely on organisational structure as a determinant of strategic aggressiveness than managers with a general background. Bantel and Jackson (1989) show that the more diverse the composition of an executive team in terms of executives' functional backgrounds (accounting, operation and lending), the more innovative the team becomes. Geletkanycz and Black (2001) document that executives in the functional areas of finance, marketing, law and general management are most strongly related to strategic commitment to the status quo (CSQ). They found that executives with a broader functional experience base tend to demonstrate broader strategic breadth. This suggests that if executives have a greater exposure to different functional areas, they may have more flexible strategic perspectives.

In terms of strategic orientation, scholars show that top executives with a technical background may favour technological alliances (Tyler and Steensma, 1998). Furthermore, CEOs' functional specialisation may influence the choice of diversification strategy (Smith and White, 1987). Smith and White (1987) explain that CEOs with core specialisation (e.g. background in production, sales management) are more likely to choose the single and vertically integrated diversification strategy. CEOs with environmental specialisation (e.g. background related to finance and law) are more likely to choose an unrelated and conglomerate diversification strategy.

Chaganti and Sambharya (1987) studied the functional backgrounds of executives in Prospector, Analyzer and Defender firms, using Miles (1982)'s typology. They found that Prospector firms tended to have a higher number of executives with a marketing background, whereas Analyzer and Defender firms had a similar number of executives with R&D, production and finance backgrounds. This suggests that functional background is related to strategic orientation.

According to Hambrick and Mason (1984), functional background can be categorised into two main types: output and throughput functions. Output functions include marketing, sales and product R&D. Managers with output functional experience tend to focus on new opportunities for growth. Throughput functions include production, process engineering and accounting. Managers with throughput

functional experience tend to focus on efficiency strategies and aim to improve their firm's processes and operation. Due to their different emphases and strategic foci, individuals who work in these different functions are likely to develop different experiences, skills and capabilities. These developments are likely to influence how executives make strategic choices and determine their firms' alliance strategies.

Strategic alliances enable firms to improve their resource endowments and better manage uncertainty (Eisenhardt and Schoonhoven, 1996, Powell et al., 1996). Firms often cannot rely on a few high-profile alliances (Hoffmann, 2007). A more comprehensive portfolio strategy can provide access to external resources and opportunities with several coordinated alliances (Gomes-Casseres, 1996). Standalone strategy tends to be more opportunities-oriented and treats every alliance as single occurrences. It is likely that top managers who adopt the standalone strategy tend to be concerned with the opportunities rather than the overall combination of resources and capabilities of the firm. They tend to neglect the importance of an efficient strategy. In comparison, those who adopt a portfolio strategy tend to take into account the effects of various alliances joined together. They may focus on certain opportunities that not only increase a firm's efficiency but also improve resource deficiency so that they can build the firm's competitive advantage (Barney, 1991).

Given that managers with output functional roles (i.e. marketing, sales and

product research and development) are likely to pursue new market opportunities, they may choose a standalone alliance strategy, because they tend to be concerned with opportunities but not the overall efficiency and benefits to the firm. In contrast, managers with throughput functional roles (i.e. production, engineering and accounting) may consider overall firm efficiency, in terms of capabilities and resources available, and are more likely to choose a portfolio alliance strategy than a standalone alliance strategy in order to formulate optimal combinations of alliances. Hence, Hypothesis 4 states:

> **Hypothesis 4 (H4)**: Managers with output functional backgrounds are more likely to choose a standalone alliance strategy, and managers with throughput functional backgrounds are more likely to choose a portfolio alliance strategy.

2.2.2. Moderating Effects of Compensation and Equity Ownership

Agency theory emphasises the problem of the separation of ownership and control, when senior executives act as the agent of shareholders and may pursue courses of actions inconsistent with the interests of owners (Eisenhardt, 1989, Jensen and Meckling, 1976). Compensation packages are the mechanism used to align the interests between shareholders and top executives. A number of studies investigated the effectiveness of pay-to-performance and performance-to-pay models (Carpenter and Sanders, 2002, Hall and Liebman, 1998, Jensen and Murphy, 1990, Tosi et al.,

2000). The results of these studies tend to be conflicting (Devers et al., 2007, Tosi et al., 2000), possibly because of other factors outside managers' control, such as environmental factors (Brouthers et al., 2000, Hitt and Tyler, 1991) and managerial characteristics (Hambrick and Mason, 1984). However, it is widely recognised that compensation packages can mitigate managerial self-interest and may reduce agency costs (Himmelberg et al., 1999, Jensen and Murphy, 1990) such as minimising the costs of executives' opportunistic behaviour and the misalignment of risk preference (Devers et al., 2007).

The nature of the compensation can influence executive behaviour in relation to managerial risk perception and opportunistic tendency (Balkin et al., 2000, Carpenter et al., 2003, Devers et al., 2007, Devers et al., 2008, Gomez-Mejia and Wiseman, 1997, Larraza-Kintana et al., 2007). Prior studies have indicated that the individual elements of compensation programmes are likely to have different or even opposite effects due to their asymmetrical risk propensities (Devers et al., 2007, Sanders, 2001, Sanders and Hambrick, 2007, Wiseman and Gomez-Mejia, 1998). This can exert an influence on executive strategic orientation (i.e. long-term vs short-term) and strategic decision-making. For instance, variable pay such as bonuses, incentives, profit-sharing and stock options may encourage executives to focus on short-term results and taking on riskier projects. Equity ownership may lead executives to be more risk averse and

adopt a long-term view on decision-making (Devers et al., 2007, Sanders, 2001). The effects of variable pay and equity ownership appear to be opposite, based on risk propensity and time horizon. The interaction of managerial characteristics with either variable pay or equity ownership may impact the choice of strategy.

Standalone strategy is quicker to establish than a portfolio strategy because, by definition, it does not require the assessment of different risks and uncertainties across all alliances of the firm. For example, a standalone approach can be a way to gain quick market access and increase revenue rapidly (Das and Teng, 1999). Therefore, managers seeking short-term gains may prefer to use the standalone strategy. In contrast, portfolio strategy requires the consideration of corporate objectives and the risk implications of all alliances together (Hoffmann, 2007). For example, executives may establish alliances in order to overcome its resource deficiency (Brouthers et al., 2009, Brouthers et al., 2014). Addressing resource deficiency using a portfolio approach allows executives to reduce risk over the long term (Hoffmann, 2007).

In the next section, I discuss variable pay and equity ownership as moderating influences between managerial characteristics and alliance strategy, with specific hypotheses.

2.2.2.1. Variable Pay

Variable pay is a part of the compensation package that is short-term and

outcome- or performance-based (Davidson III et al., 2007). It includes bonus and stock options. Scholars have argued that bonus compensation (also referred to as incentives and profit sharing) motivates executives to pursue short-term performance and forgo the long-term interests of their companies (Balkin et al., 2000, Hou et al., 2013). For example, executives may be unwilling to take on riskier projects or long-term R&D investment that is critical to long-term performance, in favour of current performance targets (Hill et al., 1992, Larraza-Kintana et al., 2007). Chief Executive Officers with high bonus pay may focus more on the short-term exploitation of new intellectual property than its long-term protection (Hou et al., 2013). Earnings-based bonuses may also drive managers to make discretionary accrual decisions in order to boost their short-term bonus (Guidry et al., 1999).

Another popular type of variable pay is stock options. Stock options give executives the right to buy a share of stock at a pre-specified price with a pre-specified term. The pre-specified price for exercising options is often different from the actual market price. The higher the actual market price is from the stock option price, the greater the gain. This motivates executives to take actions that increase share prices as much as possible in order to increase their personal wealth (Hall and Murphy, 2002). Furthermore, while executives who hold large quantities of stock options can substantially improve their personal wealth when there is a sharp increase in stock

price, they bear no personal losses when stock prices drop following company setbacks, as during this time they can choose not to exercise the options. As such, scholars have argued that stock option remuneration tolerates myopia and risk-taking (Devers et al., 2007, Goldman and Slezak, 2006, Thanassoulis, 2013). Managers who avoid taking necessary risks because they worry about losses (Amihud and Lev, 1981), personal reputation, future employability and the chance of dismissal (Fama, 1980) can, through stock options, be motivated to take big risks (Rajgopal and Shevlin, 2002). For example, stock options have a positive effect on acquisition activity because executives have opportunities to benefit from gains in stock price associated with acquisition announcements (Sanders, 2001).

2.2.2.2. Moderating effect of variable pay

Drawing on upper echelons theory, we would normally expect managerial characteristics to influence the choice of alliance strategies between standalone and portfolio strategies. However, drawing on agency theory, this relationship may be different in the presence of variable pay. Both bonus and stock options within variable pay induce a more short-term and riskier strategic behaviour that allows managers to increase their personal wealth quickly (Devers et al., 2007). A standalone strategy is simpler to implement and can reap benefits more rapidly than a portfolio strategy. It is likely that in the presence of variable pay, the effect of managerial characteristics on

choosing a standalone strategy will be strengthened because this strategy can more quickly contribute to improving firm performance. However, the effect of managerial characteristics on choosing a portfolio strategy may be weakened with variable pay because, by contrast, a portfolio strategy is more complex, takes longer to implement and may not lead to immediate results. For example, with regard to age cohort and the choice of alliance strategy, we would normally expect older managers to choose a portfolio strategy due to low risk propensity and long-term consideration (H1). In the presence of variable pay, the effect of an older manager on choosing a portfolio strategy may weaken because variable pay may bring out his/her risk-taking behaviour. In fact, it is possible that older managers may choose a standalone strategy instead. Younger managers are inclined towards a standalone strategy because they have high risk tolerance and a more short-term orientation (H1). When receiving a high variable pay in their compensation package, these tendencies are reinforced, which means that younger managers should be even more inclined to choose a standalone strategy.

In the same way, I hypothesise that higher education, business-related degrees, elite institutes, longer tenure in the firm and throughput functional role are characteristics that lead to a portfolio strategy (H2 to H4). When we include variable pay, the effects of these characteristics on portfolio strategy may be weakened and managers may be encouraged to switch to a standalone strategy in order to accumulate

more personal wealth. On the contrary, for characteristics such as lower education, non-business-related degrees, non-elite education, shorter tenure in the firm and output functional role, a standalone strategy is expected (H2 to H4). It is likely that managers with these characteristics may still choose a standalone strategy when they receive variable pay because this allows them to increase firm performance and personal wealth quickly. Therefore, I hypothesise that:

> **Hypothesis 5 (H5)**: Variable pay will moderate the relationship between managerial characteristics and firm alliance strategy. In the presence of variable pay, the choice of alliance strategy will tend to be a standalone strategy.

2.2.2.3. Equity ownership

Equity ownership includes common stock and restricted shares and is scaled by the total number of shares outstanding (Datta et al., 2005). When an executive's own equity is in the firm they serve, it is likely that the value of their wealth changes in proportion to shareholder returns. Agency theory suggests that equity ownership motivates executives to consider long-term prospects of the company (Jensen and Meckling, 1976, Jensen and Murphy, 1990). For example, Johnson and Greening (1999) show that top management team equity holdings are significantly related to producing quality products and services, as well as products that address environmental concerns. The authors argue that both product quality and

environmentally sound manufacturing are part of corporate social performance, which has a long-term, rather than a short-term objective, and it can result in long-term firm performance.

However, large equity holdings tend to increase executive risk aversion (Ofek and Yermack, 2000, Zajac and Westphal, 1994) because an executive's wealth will suffer from losses due to underperformance and will only benefit if there is growth in profits (Jensen and Murphy, 1990). If executives make decisions that are risky and prone to failure, companies' profits and earnings may suffer, and, as a result, income from equity ownership will be affected. Consequently, executives would tend to avoid risky investments with high uncertainty (e.g. R&D projects) which may have implications on executives' equity income in the long run (McConnell and Servaes, 1990). Risk aversion can also be explained by the fact that executives tend to give more importance to losses than to gains (Markowitz, 1952, Sanders, 2001, Wiseman and Gomez-Mejia, 1998). In other words, a strategy that minimises potential losses may be preferred over one that may lead to potential gains.

In addition, a key advantage of equity ownership is the potential for steady income streams. Executives are concerned with the downside risk of their salary earnings and fixed equity incentives. Downside risk refers to loss of personal income stream and employment when their firm underperforms or goes out of business

following a risk-taking decision. This may encourage risk-reducing strategy (Wright et al., 2007). Matta and McGuire (2008) suggest that high variation in a firm's returns affects the value of executives' equity holdings. Executives are likely to make conservative decisions which undercut risk exposure and generate steady returns (McConnell and Servaes, 1990, Wright et al., 1996).

2.2.2.4. Moderating effect of equity ownership

The long-term prospect of equity ownership may interact with managerial characteristics and influence how executives make such corporate strategic decisions. It is likely that in the presence of equity ownership, the effect of managerial characteristics on choosing a portfolio strategy versus a standalone strategy will change. Equity holdings encourage executives to consider the long-term prospects of the firm and may bring out risk-averse attitudes toward the management of personal financial wealth. To a large extent, equity ownership may erode the effects of managerial characteristics on choosing a standalone strategy. It is likely that equity ownership makes managers focus less on short-term gains, and, therefore, managers may become warier of the risk inherent in a standalone strategy. For example, we would normally expect less educated managers to choose a standalone strategy because they lack the cognitive ability to deploy a portfolio strategy and tend to focus on short-term gains (H2a). However, if these less educated managers have equity

ownership, then they may think more like a shareholder and become more keen to secure a long-term steady equity income based on decisions that are relatively low risk but highly beneficial to the long-term prospects of the company (Fama and Jensen, 1983, Jensen and Meckling, 1976, Jensen and Murphy, 1990). This implies that the effect of less educated manager on choosing a standalone strategy may be weakened. Therefore, it is possible that the greater the equity ownership, the more likely less educated managers will choose a portfolio strategy instead of standalone strategy, because portfolio strategy tends to be less risky and more long term than standalone strategy.

In the same way, I hypothesise that characteristics such as younger age group, non-business-related degrees, non-elite education, shorter tenure in the firm and output functional role, which would normally lead to a standalone strategy (H2 to H4), are likely to interact with equity ownership and lead managers to switch to a portfolio strategy instead. This is because equity ownership encourages managers to avoid risks that may impact on long-term firm performance and affect steady growth of equity income in the long run. For instance, managers who hold a large amount of equity would naturally prefer to benefit from a steady stream of equity income. They become more risk averse when making decisions and prefer a decision that results in a positive long-term performance. In other words, equity ownership may moderate the

relationship between managerial characteristics and alliance strategy choice.

For managers with characteristics that favour a portfolio strategy, such as with older managers, those with business-related degrees, elite education, longer tenure in the firm and those with a throughput functional role, I argue that equity ownership will strengthen a manager's preference for portfolio strategy. For example, in H2a I hypothesise that more highly educated managers will choose a portfolio strategy because they understand the importance of risk management and have the cognitive ability to use strategy that can ensure bigger returns in the long run. Equity ownership would most likely increase the tendency or the resolve of more highly educated managers to develop a portfolio strategy, as the portfolio strategy is more likely than a standalone strategy to provide a steady long-term personal income. In the same way, I hypothesise that older age group, business-related degrees, elite institutes, higher tenure in the firm and throughput functional role are characteristics that normally lead to a portfolio strategy (H1, H3 and H4). When we include equity ownership, the effects of these characteristics on portfolio strategy should be strengthened given the long-term view of equity and a more conservative (risk-averse) attitude toward personal wealth. Therefore:

> **Hypothesis 6 (H6)**: Equity ownership will moderate the relationships between managerial characteristics and firm alliance strategy. In the presence of equity ownership, managers will tend to choose a portfolio strategy.

2.3. Methodology

2.3.1. Sample

To test my hypotheses, data were collected from companies in China and Taiwan, specifically in the printed circuit board (PCB) industry and plastic rubber industry. PCB is a plastic or fibreglass board made for connecting electronic components together. The plastic rubber industry includes companies in the different stages of the value chain to produce plastic and rubber goods. These companies can be firms that produce something as simple as a plastic bag, to firms that produce plastic injection machinery. The PCB and plastic rubber industries both consist of manufacturing, equipment and machinery, raw materials and chemicals, and contract manufacturing. Printed circuit board (PCB) is indispensable to modern electronic goods and equipment. Almost all household appliances and electronic devices have electronic components and electrical signals of PCB. Plastic and rubber are also important goods that are used in every household as well as many different industries. Industrial statistics show that that global PCB output in 2014 was US$60.15 billion (WECC, 2015). PlasticEurope's published annual industrial facts data show that the industry turnover exceeds €350 billion for Europe only (PlasticsEurope, 2015).

Strategic alliance is characteristic of the PCB and plastic rubber industries; therefore, they are suitable for my research. Companies in both industries often

collaborate with partners for different activities within the value chain. PCB manufacturers would collaborate with PCB raw material manufacturers in order to ensure the supply of materials (upstream alliance). A recent example from the PCB industry is the partnership of Hitachi Chemical Co., Ltd. with Taiwan PCB Techvest Co., Ltd. (Hitachi Chemical Co, 2015). PCB manufacturers may also collaborate with their clients, such as Personal Computer manufacturers, to develop new innovative products that suit the market (downstream alliance). For example, Foxconn's partnership with Apple, and Pagatron's partnership with Apple (Dou, 2013). PCB manufacturers may also ally with other PCB manufacturers to establish a new industrial standard (horizontal alliance). PCB firms in China and Taiwan are often members of China Printed Circuit Association (CPCA) and Taiwan Printed Circuit Association (TPCA). Through these associations, members often collaborate in setting new industry standards for product innovation and manufacturing processes. For example, with regard to the recent popular topic of green manufacturing, PCB firms are collaborating with other PCB firms to set industrial standards for green manufacturing processes. In addition, a specialised industrial report suggests that PCB firms are going for partnership and strategic alliances in order to provide unique solutions and to meet changing market demands and opportunities (Lucintel, 2015). Therefore, the PCB industry provides a large research setting to investigate the

managerial strategic orientation of alliance strategy.

Similarly, firms in the plastic rubber industry are often engaged in strategic alliances through forward and backward integration in order to have better control and flexibility in raw material supplies or sales channels. For example, AD Plastiks (Croatia) and Henniges automotive (US) formed strategic alliances to benefit from each other's specialisation in 2014. Burkool SA (Brazil) and Henniges (US) formed alliances to serve Brazilian and Argentinian markets in 2013 (Sweeney, 2015). Therefore, the plastic rubber industry also provides a suitable research setting for my research.

I chose to study firms in the two industries based in China and Taiwan because these two industries produce high global output, and alliances are common practices in the two industries. For the PCB industry, these two markets (China and Taiwan) are ranked first and third worldwide in PCB output value. The two markets account for 44.9% and 14% of global PCB output, respectively. Together they represent 58.9% of total PCB output worldwide (WECC, 2015). For the plastic rubber industry, China is ranked the largest producer and accounts for 26% of global of plastic materials (PlasticsEurope, 2015). Overall, using Chinese and Taiwanese firms in the PCB and plastic rubber industries appears to be appropriate for investigating firm alliance strategy.

Scholars suggest that it is important to examine the strategic activities of top managers because strategies are viewed as reflections of the values and cognitive bases of senior managers in the firm (Brouthers et al., 2000, Hambrick and Mason, 1984, Rajagopalan et al., 1993). Therefore, I am targeting top executives (i.e. the CEOs and vice presidents) of the companies. These executives are the main decision-makers of firm strategy and are responsible for setting up the strategic directions of firm alliances.

Similar to many other strategy studies, such as Brouthers et al. (2000), Hambrick et al. (1993), Hitt and Tyler (1991), and Tyler and Steensma (1998), the data in this study were examined at the level of individual executives. Scholars suggest that managerial characteristics determine strategic choice (Hambrick and Mason, 1984) and that managers' value and perceptions shape a firm's strategic actions (Brouthers et al., 2000, Tyler and Steensma, 1998). In this study, I am interested in the extent to which top executives' demographic backgrounds may influence the choice of firm alliance strategy, and how executives' compensation packages and ownership stakes may moderate the relationship between top management characteristics and choice of alliance strategy.

2.3.2. Survey

A questionnaire was used for data collection in this study. The questionnaire was originally prepared in English, translated into Chinese, and then translated back

into English to ensure the accuracy and reliability (Brislin, 1970, Kreiser et al., 2002). Five senior managers of different companies from the sample industries helped to verify the survey contents. The survey instrument was then pilot tested with a group of another five senior managers within the two industries to see whether it was easy for them to understand and to ensure that the operational measures were appropriate for the study. When there were suggestions for improvement, I then incorporated and amended accordingly into the final survey for distribution.

2.3.3. Data Collection

In order to verify the appropriateness of respondents, each executive in the sample was contacted by phone or in person and asked if decisions regarding strategic alliances would be within his or her decision-making authority and if they were willing to participate in this study. When the executives contacted met this criterion and consented to participate in the survey, they would then receive the survey instrument via email, post, online or in person.

A survey was distributed to each qualified respondent with a letter to introduce and explain the purpose of the study as well as promise confidentiality. In order to ensure the response rate, I sent follow-up emails or make follow-up calls to check if they had received the survey. I also attempted to establish a timeframe for the return of the survey with each respondent.

2.3.4. Description of the Data

Data were collected in 2016 using a random sample of 600 companies from the PCB and plastic rubber industries. A sample of 380 companies was drawn from the directory of PCB industry in Taiwan and China (TPCA, 2015). The directory comprises approximately 5,200 firms. I used random sampling to select every tenth firm in the list and sent out an invitation to 520 firms to participate in the study via e-mail and post. Out of the 520 firms contacted, 380 accepted to participate. I then sent out the questionnaire via post and email to these firms, and hand delivered approximately one fourth of the sample. Out of 380 firms, I received 125 responses.

For the plastic rubber industry, the company list was based on the exhibitors list of Plas2016 Taipei industry exhibition. This included approximately 500 firms. During the Plas2016 industry exhibition, I randomly approached 220 firms out of the total number exhibiting firms and received 71 responses.

The total number of responses after two waves of mailing, numerous follow-up calls, emails and company visits, produced 196 responses from the two industries. Of these responses, six were not usable as these responses had too many unanswered questions. A total of 190 companies participated and successfully completed the survey. Thus, the usable data comprised 190 firms; the number of useable surveys amounted to 122 for the PCB industry and 68 from the plastic rubber industry. The response rate

is 32% for the PCB industry and 31% for the plastic and rubber industry, and the overall response rate is 32%. On average, our respondents had 628 employees, and 65% of the firms had alliance function in the company with an average 21 alliances in the past five years.

2.3.5. Dependent Variable

The dependent variable in this study is the firm's alliance strategy. In particular, I distinguish a standalone alliance strategy from a portfolio alliance strategy. Standalone alliance strategy is when all alliances are treated as standalone occurrences; each alliance is independent from other alliances and each alliance has its own specific goals. Portfolio alliance strategy is when managers take into account the strategic implications across all alliances and the portfolio strategy reflects an overall corporate strategy (Hoffmann, 2007).

To my knowledge, there are no published scales for standalone and portfolio strategies, as previous studies have not measured alliance strategy based on the standalone versus portfolio distinction. There are two main reasons that contribute to the unavailability of tested scales. Firstly, alliance research has traditionally focused on single alliances, although some scholars have suggested a portfolio approach as an alternative way to manage strategic alliances (Hoffmann, 2005, Hoffmann, 2007, Ozcan and Eisenhardt, 2009). In previous studies, scholars have been mainly

concerned with the formation, governance, evolution and performance of single alliances. For alliance portfolio research, scholars are have mainly focused on emergence, configuration and management of an alliance portfolio (Wassmer, 2010). Alliance strategies (standalone and portfolio) are treated as two separate research areas, and scholars do not view them together. Therefore, scholars have not created scales that might distinguish standalone strategy from portfolio strategy.

Secondly, scholars tend to agree on what constitutes a standalone alliance but have different views on what an alliance portfolio is (Wassmer, 2010). Scholars tend to agree that a standalone alliance is an agreement between firms in which they exchange resources and aim for sharing, or co-development of, products, technologies or services (Gulati, 1998). In contrast, scholars define alliance portfolio in a number of different ways. For example, some scholars define an alliance portfolio as the aggregate of all strategic alliances of a focal firm (Bae and Gargiulo, 2004, George et al., 2001, Hoffmann, 2005, Hoffmann, 2007, Lavie, 2007, Lavie and Miller, 2008). Other scholars define it as all direct ties with partner firms (Baum et al., 2000, Ozcan and Eisenhardt, 2009, Rowley et al., 2000). Another group of scholars define an alliance portfolio as a focal firm's accumulated alliance experience, including both ongoing and past alliances (Anand and Khanna, 2000, Hoang and Rothaermel, 2005, Kale et al., 2002, Reuer et al., 2002). Due to the issue of having different definitions

for standalone alliance and a portfolio of alliances, the measurement of these two definitions appears to be at two different levels, i.e. alliance level and portfolio level. Therefore, scholars have not created a scale that combines the two levels of analysis and measures, or that reflects the managerial choice of a firm's alliance strategy. In addition, alliance portfolio research is still burgeoning, and scholars have not conceptualised alliance strategy as standalone and portfolio.

For this study, I had to create a new scale of alliance strategy. I used DeVellis (2012) scale development guidelines. Firstly, DeVellis (2012) suggests scholars define what the study wants to measure, and draw on literature to develop a suitable number of item scales. Therefore, as recommended by DeVellis (2012), I defined alliance strategy and drew on literature to develop a three-item scale. Secondly, DeVellis (2012) suggests seeking out industry experts for clarification and verification on the items developed. I therefore contacted senior managers of different companies in the target sample industry to carry out this task. Thirdly, DeVellis (2012) recommends that the scale should be reviewed by academic experts and the scale length optimised. Fourthly, this initial measure ought to be tested by a second set of senior executives from the sample industry. Finally, items should be modified based on the feedback of the test with the second set of senior executives, to finalise the questionnaire.

From the literature, scholars identify the motivations and benefits of forming

strategic alliances such as achieving long-term strategic goals, managing risk and uncertainty (Ahuja, 2000b, Gulati, 2007, Hoffmann, 2007, Lavie, 2006, Ozcan and Eisenhardt, 2009). These are the core strategic considerations for firm alliance strategy. Therefore, I developed this measure based on my definitions of alliance strategies and taking account of the core strategic considerations suggested in the literature. The aim of this study is to see the extent to which managers view alliances as standalone occurrences or as a portfolio of alliances. Therefore, I needed respondents to be able to distinguish the two kinds of strategies. In doing so, it is important to highlight opposing characteristics of the two strategies. At the same time, scholars often present a portfolio perspective as a step up from the standalone perspective (Parise and Casher, 2003). Therefore, standalone and portfolio strategies can be presented as a continuum, using an anchored Likert scale. The first item used generic descriptions of the standalone strategy and portfolio strategy. The other two items were related to core strategic considerations for firm alliance strategy. In total, three items were used to measure the firm's tendency towards either standalone or portfolio alliance strategy.

In item 1, I developed two descriptive statements that were based on my definitions of the two strategies. Scholars have found that the use of descriptive paragraphs is an effective means of determining a firm's strategy (James and Hatten, 1995). Therefore, I used descriptive statements on both ends of the continuum to

measure a firm's alliance strategy. The statement for a standalone strategy was, 'When we make alliance decisions, each alliance is considered as an independent entity and there is a specific goal for each alliance independently from other alliances'. Portfolio strategy is described as 'When we make alliance decisions, we take into account the strategic implications of all alliances that our company is engaged in, and we consider the interrelationships among alliances, including the possible synergies that can be created through the combination of the alliances'. The respondents were asked to rate which statement best describes their company's alliance strategy on a continuum, (ranging from 1 to 7). Firms that choose towards 1 are inclined to a standalone alliance strategy and firms that choose towards 7 are inclined to a portfolio-alliance strategy.

In item 2, I developed two descriptive statements on the importance of short-term versus long-term outcomes during alliance formation. The idea is inspired by Ozcan and Eisenhardt (2009). The authors suggest that managers who are able to view their alliances in the context of their firm's industry are likely to develop a high-performing alliance portfolio. I interpreted that these managers with a long-term perspective are more likely to take a portfolio strategy. I developed a scale of 1 to 7 whereby 1 is 'We mainly consider short-term outcomes during alliance formation', and 7 is 'We mainly consider long-term alliance development goal during alliance formation'. I asked respondents to indicate the level of prioritisation for either

orientation rather than importance, because respondents may feel that both short- and long-term outcomes are important when asked this question. By assessing how managers perceive the level of prioritisation, I could gauge the tendency of a firm's alliance strategy: managers adopting a standalone strategy tend to be more in favour of short-termism, whereas managers adopting a portfolio strategy are more concerned with long-term viability and development.

For item 3, I draw on literature related to alliance risk and uncertainty. Strategic alliances allow firms to manage risk and uncertainty (George et al., 2001, Hoffmann, 2007). Managers tend to have a different risk propensity, and strategic choices are influenced by the risk preference of the decision-makers (Hoffmann, 2007). I asked respondents how they manage alliance risk and uncertainty by using two descriptive statements. On one end of the continuum, the statement reads, 'We manage risk and uncertainty of individual alliances in an independent manner'. On the other end of the continuum, the statement reads, 'We manage risk and uncertainty of all alliances together in an integrated manner'. When managers do not view managing risk and uncertainty in an integrated manner, they are likely to adopt a standalone strategy, because this strategy is less concerned with managing overall risk and uncertainty whereas a portfolio strategy encourages managers to consider the risk implications of different alliances together. Therefore, having a manager's view on risk and

uncertainty can indicate the tendency of choosing an alliance strategy.

The three-item scale reflects the strategic considerations of alliance strategy. Each statement indicates the tendency for strategic consideration during alliance decision-making. At one end of the spectrum are firms whose alliance strategy is to take a long-term perspective into forming alliances and managing overall risk and uncertainty (Hoffmann, 2007, Parise and Casher, 2003). These firms are likely to have a portfolio alliance strategy. At the other end of spectrum are firms whose alliance strategy is more short-term result oriented and more focused on risk and uncertainty related to individual alliance. These firms are likely to have a standalone alliance strategy. Therefore, the three-item scale for alliance strategy can tap into a firm's alliance strategic orientation and is suitable for the measurement of alliance strategy.

2.3.6. Independent Variables

The questions relating to managerial characteristics are based on 'observable characteristics of management' (Hambrick and Mason, 1984).

Age

An executive's age is an important variable that may influence strategic decision-making because it is related to risk propensity and a manager's experience (Bantel and Jackson, 1989, Brouthers et al., 2000, Hambrick and Mason, 1984,

Wiersema and Bantel, 1992). I used the age measure of Brouthers et al. (2000), whereby age is a continuous two-digit number reported by each respondent.

Level of education

Executives' level of education is likely to influence strategic decision-making, as scholars suggest that high levels of education are likely to develop better cognitive ability and great cognitive complexity (Brouthers et al., 2000, Hitt and Tyler, 1991, Wally and Baum, 1994). I followed Brouthers et al. (2000) and Bantel and Jackson (1989), where six categories are provided ranging from high school to doctorate (i.e. high school, some college, college degree, some postgraduate work, master's degree and doctoral degree). The categories of educational levels were changed to reflect the education systems in China and Taiwan. I asked respondents to select the education level attained from the following categories: 1 for Junior High School Education and below, 2 for High School Education, 3 for Undergraduate Degree, 4 for Master's Degree and 5 for Ph.D. (Doctor of Philosophy).

Type of education

Type of education refers to the major field of study that the executive has completed. A top manager's type of education tends to influence strategic decision-making differently (Hitt and Tyler, 1991, Tyler and Steensma, 1998). Different educational backgrounds (i.e. major fields of study) tend to have different decision

models and rules. The evaluation criteria of strategic decisions from those with engineering backgrounds may be different to those with business backgrounds (Hambrick and Mason, 1984). This survey question can be open-ended or it can also be presented by specifying different major fields of study for respondents to choose, as in Bantel and Jackson (1989) and Hitt and Tyler (1991). I followed Bantel and Jackson (1989)'s question and asked the respondent to select his/her major field of study for the highest degree earned. Following telephone interviews with a few of the sample respondents, I discovered that senior executives in the industry tend to have quite a wide spread of educational specialisations and that they are more likely to have majored in business and engineering than in other fields. Taking into consideration the potentially wide spread of educational specialisation in the PCB industry, I included 10 categories to reflect the major areas of study in China and Taiwan. These categorisations were chosen from Bantel and Jackson (1989), Hitt and Tyler (1991) and Wiersema and Bantel (1992). The respondents were requested to choose from the following categories: 1 for Accounting/Finance, 2 for Sociology and Social Studies, 3 for Art and Design, 4 for Science, 5 for Law, 6 for IT and Computing, 7 for Business/Management/Marketing, 8 for Engineering, 9 for Language, and 10 for Other Fields (that respondents can specify). When coding, this variable was coded as 1 (One) if the respondent had a degree related to business subjects, and coded as 0

(Zero) if the respondents had a degree non-business related.

Elite education

Elite education is based on the rated prestige of the universities a focal manager attended. Elite education is the origin of executives' social capital (Cao et al., 2012, Finkelstein, 1992) and can provide opportunities to facilitate alliance formation. Managers with elite education may influence the choice of alliance strategy because they may be presented with more opportunities for alliances. Graduating from an elite school indicates social status and may provide unique external resources (Gulati, 1998) and more industry-related information (Gulati, 2007). Previous studies have tended to use top executives' educational data from archival data such as the Dun and Bradstreet Reference Book of Corporate Managements, and compare the archived data with a list of elite universities used in previous studies such as Finkelstein (1992) and Tihanyi et al. (2000). In this study, the educational information is obtained from a survey questionnaire, and the research setting is different from previous studies. The sample group of top executives was based in China and Taiwan; therefore, I could not use the existing list of elite education which was compiled from the US educational institutes. I asked the respondent to specify the educational establishments they had attended for undergraduate and postgraduate studies in an open-ended question. When coding, I referred to the university ranking of the respondent's country of education. (See

appendix A and B for China and Taiwan). If respondents were educated overseas, I checked the university ranking in the corresponding countries. If overseas-educated executives had graduated from the top 20 educational institutes in the specific countries, they were considered as graduating from elite universities. The decision to use the top 20 universities was inspired by the list of Finkelstein (1992) and Tihanyi et al. (2000). The variable was coded as 0 (Zero) if the respondent did not complete a formal degree or did not have any degree from an elite university, and coded as 1 (One) if the respondent had either an undergraduate degree or postgraduate degree from an elite university.

Tenure

Tenure can be categorised into three types: positional tenure, firm tenure and industrial tenure. For this study, I used positional tenure for the measurement. Positional tenure is defined as the number of years a top executive has been employed in his or her current position. In relation to alliance strategy, positional tenure is important because strategic decisions may differ according to positional tenure, as managers may build and obtain different firm knowledge and social capital in different stages of the tenure (Hambrick and Fukutomi, 1991). The differences in firm knowledge and firm social capital are likely to influence the choice of alliance strategy. For the survey question, I followed Bantel and Jackson (1989), and I asked

respondents to specify the year he/she joined his/her current position. Tenure is thus a continuous measure.

Functional background

Functional background is defined as the functional area in which an executive has had the most experience, i.e. the longest time spent in a particular functional category (Bunderson and Sutcliffe, 2002, Rajagopalan and Datta, 1996). Scholars suggest that executive functional background influences executives' perceptions and further influences their strategic choice (Hambrick and Mason, 1984, Waller et al., 1995). Executives with differing functional backgrounds are likely to possess different knowledge, skills or cognitive orientation, and may identify business problems and formulate solutions differently (Herrmann and Datta, 2006). I drew on Bantel and Jackson (1989) for the opening question, 'The functional area in which you had the most experience?'. The only difference was that the original question used 'the person' and I used 'you'. Then I followed Bunderson and Sutcliffe (2002) for the selection of categories, because Bunderson and Sutcliffe (2002)'s categories are more suited to my sampled industries (i.e. sales or marketing, manufacturing, finance or accounting, personnel/HR (Human Resources), distribution or warehouse, R&D, equipment management, administrative support, and general management). Functional background was coded as 1 (One) for output functional background (sales and

marketing) and 0 (Zero) for all other functional backgrounds (manufacturing, distribution or warehouse, R&D, equipment management, finance, accounting, personnel/HR, administrative support and general management).

2.3.7. Moderating Variables

The effect of variable pay and equity ownership may influence the impact of a manager's demographic characteristics on the choice of alliance strategy because they are part of a compensation package. Studies have shown that a compensation package can minimise agency problems such as the opportunistic behaviour of executives and misalignment of risk preferences between executives and firms (Devers et al., 2007, Jensen and Murphy, 1990).

Variable pay

Variable pay encourages short-termism and is outcome based or performance based (Davidson III et al., 2007). It includes bonus and stock options. Variable pay motivates executives to pursue short-term performance and forgo the long-term interests of their companies (Balkin et al., 2000, Hou et al., 2013). Stock options motivate executives to take actions that have a positive impact on firm share prices because it can influence their personal wealth (Hall and Murphy, 2002). As a result, this variable is likely to influence a manager's strategic choice of alliance strategy.

Previous studies tend to use samples of listed companies for their analysis of variable pay because data are available from the Securities Exchange Commission (SEC) or other databases such as Compustat's ExecuComp Service (Beatty and Zajac, 1994, Carpenter and Sanders, 2002, Cho and Shen, 2007, Datta and Iskandar-Datta, 2014, Gomez-Mejia et al., 1987, Larraza-Kintana et al., 2007, Sanders and Carpenter, 1998, Sanders and Hambrick, 2007). From publicly available data, scholars would then conduct their own calculations for variable pay for bonus and stock options. Many studies obtain data from firms' proxy statements which are filed with the SEC. An exception to collecting variable pay data can be found in Stroh et al. (1996), whereby two open-ended survey questions are used to ask for the actual amount of base salary and bonus for a particular year, respectively. Variable pay is then calculated by dividing the bonus amount by total yearly cash compensation (salary plus bonus).

In my sample, there are many private firms, and they do not have a legal requirement to file their executives' compensation information in their respective securities exchanges. Top executives in private firms, particularly Chinese firms, would be reluctant to provide compensation information as actual figures. This may also increase their reluctance to participate in the survey. Therefore, I used an open-ended question for this variable. I asked respondents to report the percentage of their cash bonus to their overall compensation package, rather than asking for specific

figures as in Stroh et al. (1996). In addition, as I am also interested in stock options, I draw on Sanders and Hambrick (2007), who measure stock options as the proportion to total compensation paid using secondary data. For stock options, I asked two questions; the first is, 'Do you receive a stock option as part of your compensation package?' The answer could be Yes or No. If respondents answered Yes, I asked the respondents a second question to report the approximate current value of their stock options as a percentage of total compensation. I asked respondents two separate questions about their stock options because some firms may have stock options as part of an executive's pay package, while others may not. Both cash bonus and stock options provided two percentage figures which I added together to provide the percentage of variable pay over the total compensation package. I used this calculated percentage to analyse the moderating effect, i.e. variable pay may moderate the relationship between managerial characteristics and the choice of alliance strategy.

Equity ownership

Equity ownership is defined as the percentage of equity a top executive owns (Brickley et al., 1999, Sanders, 2001). Equity ownership motivates executives to consider the long-term prospects of the company (Jensen and Murphy, 1990). When top executives own equity in the firm they serve, it is likely that the value of their wealth changes in proportion to shareholder returns. Previous studies have tended to

obtain equity ownership data from publicly available data, e.g. the SEC and databases. Sanders (2001) measures equity ownership as the value of stock owned by a top executive. Other scholars measure equity ownership as a percentage of the firm's share, as in Brickley et al. (1999). In this study, I used the percentage of firm shares owned by the respondents in the company they serve. However, as I was unable to obtain secondary data on ownership for my sample, I asked respondents to directly report the percentage of firm shares they owned as an open-ended question.

2.3.8. Control Variables

I included a number of control variables that may potentially influence tendencies to choose a standalone alliance strategy or a portfolio alliance strategy. Particularly, I controlled for several characteristics of the focal firm and of its alliances. For the characteristics of the focal firm, I controlled for firm size, firm age, ownership type, international activity, R&D orientation, past performance, two industrial effects and country effect. For the characteristics of the alliances, I included alliance experience and alliance function.

Firm age

Following Brouthers et al. (2000), I included firm age as a control variable, because older firms are likely to have more alliance experience and the accumulated alliances knowledge over years may influence a firm's alliance strategy. Scholars have

shown that firm age influences strategic decision-making (Anderson and Eshima, 2013, Eisenhardt, 1989b). This may potentially influence a manager's choice of alliance strategy. Firm age was measured as the age of the firm. I asked respondents to provide the founding year of the firm.

Firm size

I controlled for firm size because scholars (e.g. Brouthers et al. (2000) and Hitt and Tyler (1991)) have suggested that large firms and small firms are likely to make strategic choices differently due to the possible difference in the availability of resources. In my sampled industries, there were also large and small firms who were likely to have very different resources and capabilities. This difference may influence the manager's choice of alliance strategy. Firm size was operationalised as the number of full-time employees (Baum and Wally, 2003, Capron and Mitchell, 2009, Schilke and Cook, 2013). For the survey question, I followed Schilke and Cook (2013) and asked, 'How many employees does your company have?'

Internationalisation activity

Previous studies in international business and strategic management suggest that a high level of firm internationalisation leads to higher firm performance (Michael Geringer et al., 1989, Tallman and Li, 1996). Strategic alliances often provide a firm access to resources and capabilities from international markets (Lu and Beamish,

2001). It is likely that a firm's international activities may influence the firm's alliance strategies because higher sales value from a particular country may lead the firm to develop its alliance strategy according to foreign market opportunities. For example, a firm that follows a portfolio strategy may consider a standalone strategy in order to take advantage of short-term opportunities. Similarly, it is possible for a firm to change from a standalone strategy to a portfolio strategy if the potential opportunity has a long-term prospect and requires, for example, investing in R&D or building a supply chain. Therefore, firms that depend to a large extent on international sales may have a different alliance strategy compared to those that are less dependent upon international sales. I borrowed the measure from international business scholars and followed Brouthers and Nakos (2005) to control for firms' international activities. This measure consists of a firm's ratio of foreign sales to total sales. I asked respondents to report the ratio of their foreign sales to total sales.

Past performance

Past performance may influence firm alliance strategy because a firm may take strategic action based on past performance in an attempt to improve performance. This means that past performance has a potential effect on a firm's choice of alliance strategy and future performance. Previous studies control for past performance using different measures and time frames (Andrevski et al., 2013, Baum and Wally, 2003,

Wiklund and Shepherd, 2003, Santhanam and Hartono, 2003). For example, Baum and Wally (2003) measure past performance with two types of firm performance: growth and profitability. Growth is measured with two items: (1) the percentage change in annual sales from 1996 to 2000 and, (2) the percentage change in year-end employment from 1996 to 2000. Profit is measured with one item: the average annual 'pretax net profit percentage of assets' for 1998, 1999 and 2000. Wiklund and Shepherd (2003) asked respondents directly to compare past performance with competitors in terms of net profit, sales growth, cash flow and growth of net worth. The items use a five-point Likert scale, ranging from 1 – 'much worse than its competitors' to 5 –'much better than its competitors'. Cronbach alpha is 0.76. Santhanam and Hartono (2003) take into account past performance not through a control variable but by adjusting current performance. The authors measure financial performance in two categories: profit ratios and cost ratios. Profit ratios include return on sales, return on assets, operating income to assets, operating income to sales and operating income to employees. Cost ratios include cost of goods sold to sales, selling and general administration expenses to sales and operating expenses to sales. Data are collected from a secondary data source (COMPUSTAT) for current and previous years. Past performance is controlled through adjusting current performance and by regressing prior year performance on current year performance. In alliance studies,

Andrevski et al. (2013) control for past performance using Return On Equity (ROE), and data are collected from a secondary source.

Past performance based on financial data is relatively accessible. However, tested scales for the measurement of past performance are relatively limited. I followed Schreiner et al. (2009)'s performance measure because it is used in the context of alliance and it asks respondents to rate their firm's performance compared to its competitors over a three-year time frame. This appears to be relevant for measuring a firm's past performance. Schreiner et al. (2009)'s measure is similar to Wiklund and Shepherd (2003)'s measure of past performance, but the items are different. Wiklund and Shepherd (2003) consider net profit, sales growth, cash flow and growth of net worth, while Schreiner et al. (2009) consider sales growth, profitability, return on investment, and building customer royalty. The Cronbach alpha for Schreiner et al. (2009) is higher at 0.93, and Wiklund and Shepherd (2003) is at 0.76. Therefore, following Schreiner et al. (2009), I asked respondents to rate the level of firm performance compared with their competitors on a seven-point Likert-type scale (ranging from "Far Better" to "Far Worse"). The question is: 'During the last three years, how well did your company perform relative to your direct competitors in terms of (1) sales growth, (2) profitability (3) return on investment (4) building customer loyalty?'.

R&D orientation

Previous studies underline the importance of R&D investments to performance outcomes (Eberhart et al., 2004, Zhang et al., 2007). In alliance studies, scholars have controlled for either R&D intensity (De Leeuw et al., 2014, Duysters and Lokshin, 2011) or R&D orientation (Schilke and Goerzen, 2010). R&D intensity has been measured in two ways: R&D expenditure divided by sales revenue (Belderbos, 2003, Zhang et al., 2007) or number of R&D employees divided by total employment (Belderbos et al., 2012). Scholars suggest a higher level of R&D orientation may influence firm performance (Cooper, 1984, Gatignon and Xuereb, 1997). Research and Development (R&D) orientation has been measured as a single-item seven-point scale asking respondents to indicate level of agreement with the statement of 'In our company, we emphasise Research and Development activities' (Schilke and Goerzen, 2010). R&D intensity often requires secondary data for the calculations, whereas data for R&D orientation can be obtained through a survey. Therefore, I followed Schilke and Goerzen (2010)'s R&D orientation measure as a control. Respondents were asked to indicate the level of agreement with the statement on a seven-point scale, ranging from 1 'strongly disagree' to 7 'strongly agree'. The statement is: 'In our company, we emphasise Research and Development activities'.

Industry effect 1&2

Strategic alliances in certain high technology industries may be more active than others (Hagedoorn, 2002). Also, alliances in some industries perform better than others owing to differences in industry structure (Krishnan et al., 2006). Hitt and Tyler (1991) found that industry affects the criteria used to make acquisitions. Many scholars argue the importance of industry in determining the strategies employed by the firms (Hitt et al., 2000). Scholars also suggest that it is important to include an industry effect as a control variable. I used Schilke and Cook (2013)'s opening question, 'Which of the following is your company's primary industry sector?' but provide a selection list based on the primary industry in my sample: (1) for manufacturing, (2) for equipment and machinery, (3) for raw materials and chemicals, (4) for others, please specify. This was coded as a dummy variable, 1 (One) for Manufacturing and 0 (Zero) for all other industries. I also included a second industrial control to distinguish companies from the PCB industry and companies from plastic rubber industry. This was also coded as dummy variables, 1 (One) for the PCB industry and 0 (Zero) for the plastic rubber industry.

In addition, another industry control is included to distinguish companies from the PCB industry and company from the plastic rubber industry. This was coded as a dummy variable.

Country effect

I included a dummy variable in order to distinguish the differences between firms from China and firms from Taiwan. Although they are similar, managerial concepts and practices may be different. In addition, institutional theory suggests that different countries may have different institutional distance as well as psychic distance (Brouthers, 2013b, Brouthers et al., 2008). This is likely to have an impact on managerial strategic orientation; therefore, it is important to control for possible difference. When coding, 1 (One) for firms from Taiwan, 0 (Zero) for firms from China.

Alliance Experience

Alliance experience is concerned with the extent to which a firm has been involved in strategic alliances (Schilke and Goerzen, 2010). It may account for path dependence in the alliance formation decision (Chung et al., 2000, Gulati and Gargiulo, 1999b) and thus potentially influence the firm's alliance strategy. Prior research has measured alliance experience as the number of alliances a firm accumulated over a period of time (Anand and Khanna, 2000, Hoang and Rothaermel, 2005, Heimeriks and Duysters, 2007, Heimeriks et al., 2014). Scholars tend to use five years as a period of examination (Kale et al., 2002, Zollo et al., 2002, Schilke and Goerzen, 2010), because it is the average period in which an alliance still contributes to the experience

level of companies (Heimeriks and Duysters, 2007). Some scholars obtain alliance data from databases such as the Strategic Alliance database of the Securities Data Company (Anand and Khanna, 2000, Kale and Singh, 2007). Other scholars create their own database for a particular industry from archival data or databases (Hoang and Rothaermel, 2005, Lavie and Miller, 2008). A few scholars obtain alliance data through survey questions (Schilke and Goerzen, 2010, Heimeriks et al., 2014). Heimeriks et al. (2014) use a survey question to request the number of strategic alliances within the past five years, with a list of categorical selection (i.e. 0–5, 6–15, 16–25, 25–40, >40 alliances). The set selection in Heimeriks et al. (2014) may be limited. Therefore, I chose to follow Zollo et al. (2002) and Schilke and Goerzen (2010), where alliance experience is measured as the number of strategic alliances within the past five years. Respondents were asked to indicate the number of strategic alliances formed by the firm within the past five years.

Alliance function

A dedicated alliance function may influence how a firm forms and manages its alliances and thus potentially influence the choice of alliance strategy. Alliance function is defined as 'a position to manage or coordinate all alliance-related activity in the firm' (Kale et al., 2002). I followed Kale et al. (2002)'s definition and asked

respondents to indicate if their company has a formal, dedicated alliance function or department that has responsibility for their firm's alliances.

2.3.9. Statistical Analysis

Common methods variance

As with all self-reported data, there is a potential for common method bias resulting from single-respondent response (Chang et al., 2010, Podsakoff et al., 2003). In order to prevent common method bias, I followed the suggestions from Chang et al. (2010) and Podsakoff et al. (2003). Firstly, through the design of the study's procedure, Chang et al. (2010) suggest using different response formats to measure different variables when designing the questionnaire. For dependent variables, I developed statements that best describe alliance strategy on a continuum, using anchored Likert-type scale questions. For the independent variables, I used a mixture of Likert scale, open-ended questions and listed choices for selection. These can avoid respondents choosing the same response pattern, which may affect the accuracy of the data (Brouthers et al., 2000). Therefore, common methods variance has been minimised through the design of the study procedures in my study.

Secondly, through statistical tests, the factor analysis is used, in which all items from each of the constructs load into an exploratory factor analysis to determine whether the majority of the variance between measures can be accounted for by one

general factor (Chang et al., 2010). The logic behind this test is that if common method variance is a serious issue in the data, a single factor will emerge, or one general factor will account for most of the covariance in the dependent and independent variables (Podsakoff et al., 2003). This statistical test can increase the reliability of the data for interpretation (Brouthers et al., 2003). The result of factor analysis is presented in the result section.

Reliability and validity

Before testing the hypotheses, I conducted statistical tests for multi-item constructs using coefficient alphas (α), composite reliabilities (CR) and average variances extracted (AVE). If all three values for each construct exceed the recommended thresholds, i.e. $(\alpha) \geq 0.7$, $(CR) \geq 0.7$ and $(AVE) \geq 0.5$, this demonstrates adequate convergent validity and reliability (Bagozzi and Yi, 2012, Bagozzi and Yi, 1988).

Hypotheses Testing

For hypothesis H1 to H4, Ordinary Least Square regression analysis was used. To test for the moderating effects of variable pay and equity ownership in hypothesis H5 and H6, I used moderation analysis in SPSS through regression analysis on interaction terms. This allows examining the impact of one independent variable on

the relationship between another independent and dependent variable (Preacher et al., 2007).

2.4. Results

2.4.1. Validity and Reliability

I first conducted analyses on multi-item constructs in this study. There are two multi-item constructs, which are past performance and alliance strategy. I used factor analysis, Cronbach's alpha and average variance extracted (AVE) to examine construct reliabilities. Cronbach's alpha and Average Variance Extracted (AVE) are indicative of a reliable and valid measurement of each individual construct. The AVE and Cronbach's alpha for past performance are 0.76 and 0.89, respectively. For alliance strategy, AVE is 0.76 and Cronbach's alpha is 0.84. (See Table 2-1). The table shows that all items load onto their predicated variable significantly with acceptable AVE and Cronbach's alpha.

Table 2- 1: Factor analysis and Cronbach alpha

FACTOR ANALYSIS AND CRONBACH'S ALPHA			
N = 190	Eigenvalue	Average Variance Extracted Factor loading	Cronbach alpha
Past Performance			
During the last 3 years, how well did your company perform relative to your direct competitors in terms of?	3.04	75.997	0.894
1. Sales growth		.841	
2. Profitability		.920	
3. Return on Investment		.880	
4. Building customer loyalty		.844	
Alliance Strategy	2.272	75.746	
When we make alliance decisions, each alliance is considered as an independent entity and there is a specific goal for each alliance independently from other alliances **VERSUS** When we make alliance decisions, we take into account the strategic implications of all alliances that our company is engaged in, and we consider the inter-relationships among alliances, including the possible synergies that can be created through the combination of the alliances		.919	0.839
We mainly consider short-term outcome during alliance formation **VERSUS** We mainly consider long-term alliance development goal during alliance formation		.872	
We manage risk and uncertainty of individual alliances in an independent manner **VERSUS** We manage risk and uncertainty of all alliances together in an integrated manner		.817	

Furthermore, correlation analysis was also conducted. The inter-item correlations between variables were examined. The majority of the inter-item correlations between variables were all relatively low, generally falling between 0.0 and 0.49. There were a few exceptions which had inter-item correlation values exceeding 0.5, such as educational level and elite education (r =0.517), and age and tenure (r = 0.537). There were a few interaction terms between variable pay and managerial characteristics, and between equity ownership and managerial characteristics, which had high inter-item correlations, with values from 0.525 to 0.699. These were expected because the interaction terms are the product of variable pay and equity ownership with each of the managerial characteristics. These interactions were calculated for moderation analysis, and none of the interactions exceeded the recommended cut-off of 0.7 (Hair, 2009). As summarised in Table 2-2, the majority of inter-item correlations between those variables were relatively low, at low to moderate levels. This is one indication that the variables are unidimensional and that there exists, as a result, good validity, which does not threaten discriminant validity.

In addition, I examined the variance inflation factors (VIF) in our regression tests (See Table 2-3 and 2-4) and found that no VIF score was greater than 2.5, indicating a low probability of collinearity.

Table 2- 2: Correlation matrix with means and standard deviations

	Means, Standard Deviation, Correlations																														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Mean	14.363	26.032	627.503	44.676	6.005	0.653	21.332	18.968	0.295	0.642	0.942	0.000	0.000	0.347	0.416	0.000	0.358	0.000	0.000	0.044	0.236	0.007	0.074	-0.036	-0.004	0.068	-0.215	-0.012	-0.090	0.245	-0.059
	Standard Deviation	3.247	15.748	1931.820	25.842	0.892	0.477	19.972	3.627	0.457	0.481	0.234	1.000	1.000	0.477	0.494	1.000	0.481	1.000	1.000	1.071	1.186	0.562	0.691	1.143	0.584	1.020	1.049	0.574	0.575	1.095	0.578
1	Alliance Strategy	1																														
2	Firm Age	.065	1																													
3	Firm Size	-.002	.337**	1																												
4	International Sales	.066	.152*	.203**	1																											
5	RD Orientation	.176*	.137	-.034	.067	1																										
6	Alliance Function	.256**	.152*	.094	.208**	.129	1																									
7	Alliance number	-.067	.331**	.272**	.322**	.092	.304**	1																								
8	Past Performance	.278**	.172*	.054	.115	.406**	.120	.022	1																							
9	Industry effect 1	.320**	.098	.304**	-.156*	.126	.205**	-.015	.100	1																						
10	Industry effect 2	.260**	-.103	.189**	-.201**	-.144*	-.037	-.322**	-.043	.483**	1																					
11	Country effect	.049	.140	.019	.231**	.229**	.103	.105	.069	.012	-.185*	1																				
12	Respondent age	.046	.172*	.179*	.047	.232**	.165*	.045	-.059	.263**	.127	.197**	1																			
13	Educational level	.078	-.086	.031	.079	-.194**	.059	.074	.003	-.102	.133	-.143*	-.259**	1																		
14	Major in Business	-.010	-.037	.000	.066	.126	.114	.021	.145*	-.132	-.124	.086	-.085	.095	1																	
15	Elite Education	.083	-.047	.180*	.137	-.233**	.077	.079	-.032	.110	.251**	-.065	.003	.517**	-.055	1																
16	Tenure	.130	.110	.019	-.036	.197**	.002	-.110	.009	.095	.155*	.106	.537**	-.253**	-.046	-.019	1															
17	Ouput functional Bgd	.077	-.063	-.057	.037	.026	-.193**	-.064	.110	-.097	.122	-.003	-.264**	.071	.078	-.028	-.223**	1														
18	Variable pay	-.053	-.016	.075	.071	.177*	.045	.040	.053	-.067	-.040	.125	.044	.237**	.014	.150*	-.036	-.008	1													
19	Equtiy Ownereship	-.012	-.130	-.231**	-.101	.104	-.052	-.183*	-.036	-.101	-.207**	.176*	.069	-.216**	-.025	-.183*	.247**	-.124	-.114	1												
20	Variable pay X Respondent Age	.052	-.024	.100	-.170*	-.114	.060	-.073	.091	.016	.156*	-.183*	-.215**	.037	-.001	-.038	-.116	-.002	.068	-.060	1											
21	Variable pay X Educational level	-.066	.044	-.001	-.151*	.061	-.096	.050	-.064	-.099	.018	-.126	.034	.102	-.061	.049	.052	-.149*	.271**	-.007	-.038	1										
22	Variable pay X Major in business	-.108	.005	.068	.091	.157*	.095	.065	.150*	-.070	-.074	-.039	.027	.085	.016	.109	-.036	.057	.562**	-.115	-.015	.133	1									
23	Variable pay X Elite Education	-.032	.089	.150*	-.055	.095	.020	.083	.029	.002	.017	.010	-.003	.184*	.022	.127	-.029	-.111	.699**	-.069	.087	.651**	.359**	1								
24	Variable pay X Tenure	.050	.009	.103	.024	.082	.059	.010	.168*	.062	.121	-.038	-.108	.054	-.014	-.009	-.055	.082	.177*	-.031	.525**	-.085	.177*	.128	1							
25	Variable pay X Functional Backgorund	-.109	-.115	-.092	.144*	.284**	.001	-.008	.034	-.084	-.156*	.179*	.025	.000	.068	-.031	.055	-.009	.584**	.064	-.240**	.065	.388**	.272**	.012	1						
26	Equity ownership X Respondent Age	.087	.043	-.139	.032	-.126	.088	.059	-.022	.048	.020	-.124	-.025	-.044	-.083	.035	.161*	-.106	-.063	-.024	.049	.005	-.024	-.050	-.012	-.062	1					
27	Equity ownership X Educational level	-.096	-.092	.041	.080	-.062	-.014	-.049	-.075	.004	.040	.125	-.043	.020	-.014	.013	-.261**	.179*	-.008	-.085	.028	-.151*	-.026	-.045	.075	.044	-.281**	1				
28	Equity ownership X Major in business	.031	-.039	-.131	-.073	.092	-.111	-.140	.093	-.044	-.121	.067	-.029	-.143*	-.028	-.140	.044	-.078	-.113	.574**	-.021	-.020	-.200**	-.067	-.024	.010	-.131	-.037	1			
29	Equity ownership X Elite Education	-.091	-.127	-.235**	-.063	.052	-.092	-.173*	-.126	-.085	-.064	.102	.080	-.145*	-.048	-.186*	.117	.007	-.083	.589**	-.043	-.040	-.083	-.103	.016	.069	.054	.444**	.235**	1		
30	Equtiy ownership X Tenure	.098	.124	-.065	-.111	.013	.013	.002	-.028	.148*	.103	-.022	.150*	-.250**	-.116	-.066	.335**	-.072	-.032	.170*	-.023	.031	-.028	-.006	-.091	-.031	.577**	-.474**	.035	.023	1	
31	Equity ownership X Output Functional	-.065	-.164*	-.089	-.090	-.035	.008	-.112	-.117	-.105	-.133	.117	-.048	.022	-.018	-.019	.087	-.138	.065	.584**	-.056	.061	.012	.070	-.035	.110	-.356**	.136	.349**	.401**	-.108	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

2.4.2. Hypotheses Testing

To test the hypotheses, I first used hierarchical regression for two regression models, one with the 10 control variables only – firm age, firm size, international activities, RD orientation, alliance function, alliance number, past performance, two industrial effects and country effect, with the second model adding top managers' demographic characteristics as the independent variables – age, educational level, major in business, elite education, tenure and function background. Alliance strategy was the dependent variable in the two models.

The regression results are reported in Table 2-3. Model 1 shows that firm size ($p < 0.05$), alliance function ($p < 0.01$), past performance ($p < 0.01$), industry effect 1 ($p < 0.05$), and industry effect 2 ($p < 0.01$) were significantly related to alliance strategy. The control variables, Model 1, accounted for 25.8% ($p < 0.01$) of the variance in alliance strategy.

In Table 2-3, Model 2, I added the independent variables of managerial characteristics. Model 2 shows that the independent variable of tenure ($p < 0.05$) was a significant predictor of alliance strategy, and control variables of firm size ($p < 0.1$), alliance function ($p < 0.01$), past performance ($p < 0.05$), industry effect 1 ($p < 0.01$) and industry effect 2 ($p < 0.1$) were significantly related to alliance strategy. The managerial characteristics as independent variables accounted for an increase of 3% of

the variance in alliance strategy in R^2 compared to Model 1. F-statistics was significant. However, age (negatively related), educational level, major in business (negatively related), elite education (negatively related) and functional background were not statistically significant. Therefore, Hypotheses 1, 2a, 2b, 2c and 4 are not supported, whereas Hypothesis 3 is supported.

Table 2- 3: Regression results for the effects of control variables, managerial characteristics on alliance strategy

Dependent Variable	Alliance Strategy				Alliance Strategy			
	Model 1				Model 2			
Control Varaibles	B		SE	Sig	B		SE	Sig
Firm age	0.011		0.015	0.470	.010		.015	.501
Firm size	0.000	**	0.000	0.045	.000	*	.000	.091
International sales	0.015		0.009	0.106	.014		.009	.138
RD orientation	0.206		0.270	0.445	.228		.288	.430
Alliance Function	1.315	***	0.482	0.007	1.497	***	.499	.003
Alliance Number	-0.012		0.013	0.338	-.014		.013	.276
Past performance	0.186	***	0.064	0.004	.161	**	.066	.016
Industrial effect 1	1.447	**	0.584	0.014	1.817	***	.609	.003
Industrial effect 2	1.507	***	0.560	0.008	1.021	*	.609	.096
Country effect	0.225		0.957	0.814	.365		.971	.707
Independent variables								
Age					-.356		.276	.199
Educational Level					.354		.268	.189
Major in School					-.291		.461	.529
Elite education					-.082		.535	.878
Tenure					.525	**	.264	.048
Functional Background					.628		.484	.196
Constant	6.616		1.805	0.000	6.885		1.914	.000
F statisitcs (Sig)	6.220***				4.370***			
F Change					1.213			
R square	0.258				0.288			
Adjusted R square	0.216				0.222			
R square change					0.030			
Note: N=190								
* p < 0.10, ** p < 0.05, *** p < 0.01								

Regression analysis was used to test Hypotheses H5 and H6 for moderating effects of variable pay and equity ownership between managerial characteristics and alliance strategy. The regression results are shown in Table 2-4. The base model (Main effect – Model 3) included main effects of controls, managerial characteristics and two moderating influences – variable pay and managers' equity ownership. Alliance strategy was the dependent variable in all models. Model 3 shows that alliance function ($p < 0.01$), past performance ($p < 0.05$), industry effect 1 ($p < 0.01$) and industry effect 2 ($p < 0.1$) were significantly related to alliance strategy. The independent variable of tenure ($p < 0.1$) was also significantly related to alliance strategy. Model 3 shows a small R^2 change of 0.006 compared to Model 2. F-statistics was significant. The two moderating influences of variable pay and equity ownership were not significant at the base model.

Models 4 to 9 were used to test Hypothesis 5. For each of the six models, one interaction term (variable pay by one of the six managerial characteristics) was entered after the base model. This is because interaction terms may cause multicollinearity problems, which are likely to affect regression results. Scholars suggest that multicollinearity does not affect R, R^2 or change in R^2 (Brouthers et al., 2000, Hair, 2009). Also, entering each interaction term after the base model singularly allows one to see that the changes in R^2 are relevant to a particular interaction. Thus, any significant improvement in R^2 is attributable to the interaction. In Model 4, I added the interaction

term of age and variable pay. The results of control variables and independent variables were mainly the same as model 3, except for industry effect 2, which was no longer significant. Also, the interaction was not significant. The R^2 change was 0.001, and F-statistic was significant.

In Model 5, I added the interaction term of educational level and variable pay. The result of control variables and independent variables were the same as model 4 and the interaction was not significant. The R^2 change was 0.001, and F-statistics was significant.

In Model 6, I added the interaction term of major in business and variable pay. The control variables, independent variables and moderators had the same results as Models 4 and 5. The interactions term was significant with a negative β coefficient of 0.884 at ($p < 0.1$). R^2 change was 0.015, and F-value was statistically significant.

In Model 7, I added the interaction term of elite education and variable pay. The result of control variables, independent variables and moderating variables were the same as Model 4, 5 and 6. However, the interaction was not significant. R^2 change of 0.001, and F-statistics was significant.

In Model 8, I added the interaction term of tenure and variable pay. The interaction term was not significant. The result of controls, independent variables and moderating variables were mainly the same as Models 4, 5, 6 and 7, in which only

tenure was significant at ($p < 0.1$). Also, industry effect 2, which became significant at ($p < 0.1$). However, change in R^2 was only 0.001, and F value was significant.

In Model 9, I added the interaction term of functional background and variable pay. The interaction was significant at ($p < 0.1$) with a negative β coefficient of 0.794. The R^2 change was 0.011 and was significant. The control variable of international activities became significant at ($p < 0.1$), and industry effect 2 was not significant anymore compared to Model 8 and the base model. The independent variable of tenure became insignificant. F value was still significant.

In summary, Models 4 to 9 show that the interactions for two of the six managerial characteristics significantly improve the base model. The interaction with a major in business (R^2 change = 0.015, $p < 0.1$) and output functional background ($R^2 = 0.011$, $p < 0.1$) significantly improve the explanatory power over the main effects model. Therefore, Hypothesis 5 was partly supported.

Models 10 to 15 were used to test Hypothesis 6. For each of the six models, one interaction term (equity ownership by one of the six managerial characteristics) was entered in each model separately. In Model 10, I added the interaction term of equity ownership and age. The interaction term was not significant. The control variables had the same result as the base model (Model 3), and the independent variable of tenure was no longer significant. R^2 change was 0.001, and F value was significant.

In Model 11, I added the interaction term of equity ownership and educational level. The interaction term was not significant. The control variables had the same result as base model (Model 3) and independent variable of tenure was not significant as model 10. R^2 change of 0.006, and F value was significant.

Model 12, I added the interaction term of equity ownership and major in business. The interaction term was not significant. The control variable of industry effect 2 was not significant anymore compared to Model 11. The independent variable of tenure became significant at ($p < 0.1$), the same as the base model (Model 3). R^2 change was 0.001, and F value was significant.

In Model 13, I added the interaction term of equity ownership and elite education. The interaction term was not significant. The control and independent variables had the same result as base model (Model 3). R^2 change was 0.008, and F statistics was significant.

Model 14, I added the interaction term of equity ownership and tenure. The interaction term was not significant. The control variable of industry effect 2 was not significant as Model 13 and the base model. The independent variable of tenure was not significant anymore compared to Model 3. R^2 change was 0.003, and F statistic was significant.

Model 15, I added the interaction of equity ownership and output functional

background. The interaction term was not significant. The control of industry effect 2 was not significant but tenure became significant at ($p < 0.1$) compared to Model 3. R^2 change was 0.001, and F statistic was significant.

In summary, Model 10 to 15 were used to test Hypothesis 6. With the same procedure as Models 4 to 9, in each model only one interaction term was entered after the base model (equity ownership by one of the six managerial characteristic). The regression result shows that none of the interactions terms between equity ownership and managerial characteristics were statistically significant. Therefore, Hypothesis 6 is not supported.

Table 2- 4: Regression results for moderating effects of managerial characteristics, total variable pay and shareholdings on alliance strategy

Dependent Variable	Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy			
	Main Effects (Model 3)				Model 4				Model 5				Model 6				Model 7				Model 8				Model 9			
Control Variables	B		SE	Sig.	B		SE	Sig.	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	0.010		0.015	0.530	0.010		0.015	0.529	0.009		0.015	0.552	.009		.015	.561	.009		.016	.585	.010		.015	.536	.006		.015	.678
Firm size	0.000		0.000	0.130	0.000		0.000	0.115	0.000		0.000	0.132	.000		.000	.143	.000		.000	.120	.000		.000	.141	.000		.000	.094
International sales	0.014		0.009	0.146	0.015		0.010	0.128	0.014		0.010	0.136	.014		.009	.133	.014		.010	.129	.014		.009	.144	.016	*	.009	.084
RD orientation	0.303		0.297	0.308	0.318		0.298	0.288	0.292		0.299	0.331	.322		.294	.276	.303		.297	.310	.307		.297	.303	.391		.300	.194
Alliance Function	1.504	***	0.500	0.003	1.461	***	0.507	0.004	1.524	***	0.505	0.003	1.595	***	.499	.002	1.518	***	.502	.003	1.518	***	.502	.003	1.464	***	.498	.004
Alliance Number	-0.014		0.013	0.278	-0.014		0.013	0.281	-0.015		0.013	0.263	-.015		.013	.270	-.015		.013	.257	-.014		.013	.286	-.015		.013	.256
Past performance	0.160	**	0.067	0.017	0.155	**	0.067	0.022	0.161	**	0.067	0.017	.175	***	.067	.009	.160	**	.067	.017	.164	**	.067	.016	.150	**	.067	.025
Industry effect 1	1.737	***	0.614	0.005	1.772	***	0.619	0.005	1.770	***	0.622	0.005	1.670	***	.610	.007	1.741	***	.615	.005	1.733	***	.616	.005	1.807	***	.612	.004
Industry effect 2	1.039	*	0.626	0.099	0.982		0.635	0.124	1.015		0.631	0.110	.963		.622	.124	1.008		.629	.111	1.077	*	.633	.091	.957		.624	.127
Country effect	0.458		0.994	0.646	0.510		1.001	0.611	0.506		1.005	0.615	.123		1.002	.902	.500		.999	.618	.440		.997	.659	.519		.990	.601
Independent variables																												
Age	-0.331		0.278	0.235	-0.301		0.284	0.291	-0.332		0.279	0.235	-.313		.276	.258	-.317		.280	.258	-.346		.281	.220	-.373		.278	.181
Level of education	0.426		0.275	0.123	0.435		0.276	0.117	0.422		0.276	0.128	.363		.275	.189	.427		.275	.123	.424		.276	.125	.385		.275	.163
Major in business	-0.319		0.464	0.492	-0.316		0.465	0.498	-0.314		0.465	0.501	-.335		.460	.468	-.336		.466	.472	-.328		.465	.482	-.278		.462	.548
Elite education	-0.034		0.538	0.950	-0.008		0.541	0.989	-0.037		0.539	0.945	.062		.536	.908	-.040		.539	.941	-.051		.540	.926	-.049		.535	.927
Tenure	0.490	*	0.272	0.073	0.494	*	0.273	0.072	0.490	*	0.273	0.074	.485	*	.270	.074	.494	*	.273	.072	.490	*	.273	.074	.528		.272	.054
Functional background	0.623		0.485	0.201	0.642		0.487	0.190	0.653		0.494	0.187	.709		.484	.144	.667		.493	.178	.629		.487	.198	.614		.483	.205
Moderators																												
Variable pay %	-0.261		0.229	0.257	-0.277		0.231	0.233	-0.283		0.238	0.236	.021		.271	.940	-.383		.321	.234	-.242		.233	.301	.011		.281	.969
Shareholding %	0.063		0.242	0.796	0.059		0.242	0.807	0.059		0.242	0.808	.046		.240	.850	.051		.243	.835	.069		.243	.776	.078		.241	.748
Interactions																												
Age X Variable pay					0.120		0.217	0.580																				
Educational level X Variable pay									0.071		0.197	0.719																
Major in school X Variable pay													-.884	*	.467	.060												
Elite education X Variable pay																	.247		.451	.584								
Tenure x Variable pay																					-.083		.195	.669				
Function x Variable pay																									-.794	*	.480	.100
Age X Shareholdings																												
Educational level X Shareholdings																												
Major in school X Shareholdings																												
Elite education X Shareholdings																												
Tenure x Shareholdings																												
Function x Shareholdings																												
Constant	6.382		1.963	0.001	6.334		1.968	0.002	6.347		1.970	0.002	6.256		1.949	.002	6.343		1.968	.002	6.272		1.984	.002	6.022		1.965	.003
F statisitcs (Sig)	3.953***				3.746***				0.3733***				3.990***				3.745***				3.737***				3.927***			
F Change	0.727				0.308				0.130				3.590				0.300				0.184				2.738			
R square	0.294				0.295				0.294				0.308				0.295				0.295				0.305			
Adjusted R square	0.219				0.216				0.216				0.231				0.216				0.216				0.219			
R square change	0.006				0.001				0.001				0.015				0.001				0.001				0.011			
VIF Range	1.127-2.077				1.127-2.133				1.128-2.101				1.127-2.085				1.252-2.094				1.129-2.118				1.113-2.090			
Note: N=190																												
* p < 0.10, ** p < 0.05, *** p < 0.01																												

Dependent Variable	Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy			
	Model 10				Model 11				Model 12				Model 13				Model 14				Model 15			
Control Variables	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.009		.015	.559	.008		.015	.596	.009		.015	.557	.010		.015	.521	.008		.016	.602	.009		.016	.558
Firm size	.000		.000	.181	.000		.000	.150	.000		.000	.131	.000		.000	.095	.000		.000	.165	.000		.000	.146
International sales	.013		.009	.165	.014		.009	.126	.014		.009	.149	.015		.009	.122	.014		.009	.139	.013		.009	.156
RD orientation	.332		.301	.271	.303		.296	.307	.296		.297	.321	.313		.296	.292	.323		.298	.280	.298		.298	.318
Alliance Function	1.484	***	.502	.004	1.516	***	.499	.003	1.543	***	.504	.003	1.474	***	.499	.004	1.501	***	.501	.003	1.521	***	.503	.003
Alliance Number	-.015		.013	.257	-.016		.013	.232	-.014		.013	.286	-.015		.013	.266	-.016		.013	.246	-.015		.013	.274
Past performance	.159	**	.067	.018	.154	**	.067	.022	.154	**	.067	.023	.150	**	.067	.027	.161	**	.067	.017	.158	**	.067	.020
Industry effect 1	1.695	***	.619	.007	1.723	***	.613	.006	1.735	***	.615	.005	1.719	***	.613	.006	1.690	***	.619	.007	1.729	***	.616	.006
Industry effect 2	1.041	*	.627	.098	1.063	*	.625	.091	1.026		.627	.104	1.118	*	.627	.076	1.003		.629	.113	1.031		.627	.102
Country effect	.534		1.004	.596	.657		1.005	.514	.477		.996	.633	.458		.991	.645	.514		.999	.607	.487		.999	.626
Independent variables																								
Age	-.308		.281	.274	-.297		.279	.289	-.329		.278	.239	-.289		.279	.302	-.317		.279	.258	-.342		.280	.223
Level of education	.437		.276	.115	.418		.275	.130	.429		.275	.121	.437		.274	.113	.462		.281	.101	.437		.277	.117
Major in business	-.309		.465	.508	-.340		.463	.465	-.314		.465	.500	-.333		.463	.472	-.309		.465	.507	-.324		.465	.487
Elite education	-.040		.539	.940	-.032		.537	.952	-.032		.538	.952	-.109		.539	.839	-.042		.539	.938	-.033		.539	.951
Tenure	.452		.280	.109	.400		.281	.156	.516	*	.275	.063	.459	*	.272	.094	.441		.282	.119	.493	*	.273	.073
Functional background	.641		.487	.190	.702		.489	.153	.650		.488	.184	.675		.485	.166	.615		.486	.207	.609		.488	.214
Moderators																								
Variable pay %	-.264		.229	.251	-.274		.229	.233	-.252		.230	.273	-.262		.228	.252	-.277		.231	.231	-.249		.231	.283
Shareholding %	.071		.243	.770	.051		.241	.833	-.044		.289	.878	.280		.288	.332	.041		.244	.867	.127		.292	.664
Interactions																								
Age X Variable pay																								
Educational level X Variable pay																								
Major in school X Variable pay																								
Elite education X Variable pay																								
Tenure x Variable pay																								
Function x Variable pay																								
Age X Shareholdings	.134		.224	.552																				
Educational level X Shareholdings					-.269		.216	.215																
Major in school X Shareholdings									.311		.460	.500												
Elite education X Shareholdings													-.644		.467	.169								
Tenure x Shareholdings																	.148		.217	.496				
Function x Shareholdings																					-.187		.473	.694
Constant	6.206		1.988	.002	6.242		1.963	.002	6.507		1.974	.001	6.438		1.958	.001	6.251		1.975	.002	6.447		1.974	.001
F statisitcs (Sig)	3.749***				3.838***				3.757***				3.865***				3.758***				3.735***			
F Change	0.355				1.551				0.458				1.904				0.466				0.156			
R square	0.295				0.300				0.296				0.302				0.296				0.294			
Adjusted R square	0.217				0.222				0.217				0.224				0.217				0.216			
R square change	0.001				0.006				0.002				0.008				0.002				0.001			
VIF Range	1.204-2.007				1.128-2.079				1.127-2.079				1.127-2.094				1.128-2.092				1.127-2.079			
Note: N=190																								
* p < 0.10, ** p < 0.05, *** p < 0.01																								

In order to understand the effect of the two significant interaction terms, I graphed the two significant interactions results in Figure 2-1 and 2-2. Figure 2-1 shows that the moderator of variable pay negatively impacts on the relationship between business major and alliance strategy. Figure 2-2 shows the moderating influence of variable pay on the relationship between output functional background and alliance strategy. It is also an antagonistic relationship. Therefore, an increase in variable pay appears to negatively impact the association between major in business and alliance strategy as well as the relationship between output functional background and alliance strategy.

Figure 2 - 1: Interaction effect of variable pay between alliance strategy and major in business

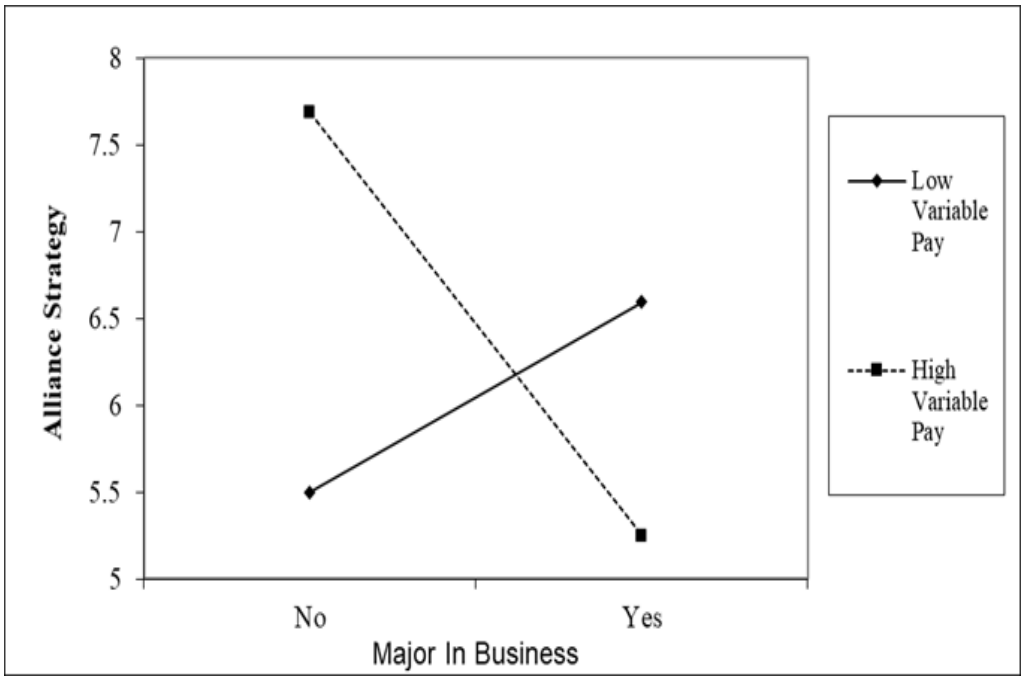
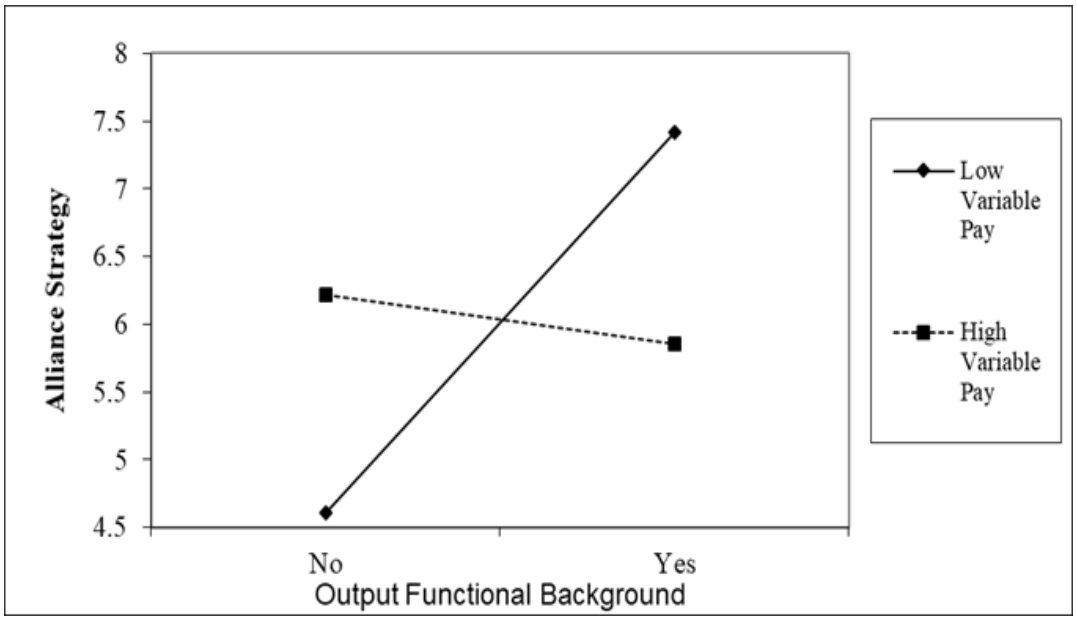


Figure 2 - 2: Interaction effect of variable pay between alliance strategy and output functional background



2.4.3. Robustness Tests

2.4.3.1. Test for industry effect with sub-industry dummy variables

In the original regression analysis (Table 2-3 and 2-4), I used industry effect 1 and industry effect 2 to control for industrial differences. Industry effect 1 is used to distinguish whether a firm is operating as a manufacturer or contract manufacturer. Industry effect 2 was used to identify firms from the two industries, i.e. the PCB and plastic industries. I found that both industry effect 1 and 2 are significantly related to alliance strategy at ($p < 0.05$) and ($p < 0.01$) respectively. However, different sub-industries may also have an impact on the choices of alliance strategies. Therefore, I checked the robustness of my results by analysing if there are major differences with my findings when industry effect 1 is sub-divided into more categories and when

industry effect 2 is separated into two samples.

First, I re-coded the industry effect 1 data into four sub-industrial categories (1. manufacture and contract manufacture, 2. equipment and machinery, 3. raw material and chemicals, and 4. others). Then, I created three industry dummy variables for equipment and machinery, raw materials and chemical, and others, with manufacture and contract manufacture as the reference category to see if these sub-industries would impact on my hypotheses. The results of this regression analysis show that control variables were mainly the same compared to the original regression analysis in Table 2-3 and 2-4, except for firm size, which is significant at ($p < 0.1$) instead of ($p < 0.05$). The results of the re-coded control variables show that equipment & machinery ($p < 0.05$), raw materials and chemicals ($p < 0.05$), and others ($p < 0.05$) were significantly related to alliance strategy. All significant hypotheses such as Hypothesis 3 (Model 2) for managerial characteristics of tenure, Hypothesis 5 (Model 6 and 9) for the two interaction terms (major in business and variable pay, functional background and variable pay) are both still significant at ($p < 0.1$). There is not any other significant hypothesis. The control variable of alliance function remains at ($p < 0.01$) and past performance at ($p < 0.05$). This robustness test has similar results as the original regression results in Table 2-3 and 2-4. The results of this robustness test are presented in Table 2-5 and 2-6.

As a second robustness test, I split the data into two samples, one for PCB firms only and another for plastic firms only. This is because there may be some differences between the two industries that can cause managers to choose different alliance strategies. Therefore, I conducted four further regression analyses to see if there is any impact on my hypotheses.

For the PCB industry, there are 122 firms in the sample. I ran two regression analyses for this sample. For the first regression analysis, I used industry effect 1 (manufacture and contract manual manufacture) as a control variable that is the same as the regression analysis in Table 2-3 and 2-4. For the second regression, I used the three sub-industrial dummy variables for equipment and machinery, raw materials and chemicals, and others, with the manufacture with contract manufacture as the reference category.

The results of the two regression analyses are mainly the same compared to the initial regression results presented in Table 2-3 and 2-4. The first regression results are reported in Table 2-7 and 2-8. The second regression results are reported in Table 2-9 and 2-10. The regression results of this robustness test are similar as the original regression results in Table 2-3 and Table 2-4. The only difference is that age became significant at ($p < 0.05$) compared to the original regression analysis in Table 2-3.

In Table 2-8, Models 4 to 9 were used to test Hypothesis 5 for the interaction

terms between managerial characteristics (age, educational level, major in business, elite education, tenure and output functional background) and variable pay. Compared to the initial regression analysis in Table 2-4, I found that the interaction term for major in business and variable pay (Model 6) is still significant at ($p < 0.05$, R^2 change = 0.023). However, the interaction term for output functional background and variable pay (Model 9) is no longer significant.

In Table 2-8, Models 10 to 15 were used to test Hypothesis 6 for the interaction terms between the managerial characteristics (age, educational level, major in business, elite education, tenure and output functional background) and share ownership. The regression results show that the control and independent variables are mainly the same as the base model (Model 3). None of the interaction terms between managerial characteristics and share ownership were statistically significant. Hypothesis 6 is not supported, which is the same as the original regression analysis in Table 2-4.

In Table 2-9, Model 2 shows that age became significant, unlike the original regression analysis in Table 2-3.

In Table 2-10, compared to the initial regression analysis in Table 2-4, the result of the interaction term for major in business and variable pay (Model 6) has an improved significance level at ($p < 0.05$), and R^2 change is improved from 0.308 to 0.320. The interaction term for output functional background and variable pay (Model

9) is at the same significant level at ($p < 0.1$), and R^2 change is improved from 0.305 to 0.311. Hypothesis 5 is still partly supported.

For the plastic and rubber industry (PLAS), there are only 68 firms in the sample. I ran two further regression analyses to the PCB industry. There was no significant regression result (See Table 2-11).

2.4.3.2. Test for the dependent variable - Alliance Strategy as two-item scale

One of the measurement items for the dependent variable "Alliance Strategy" (Item 2) measures executives' view on long-term versus short-term horizons when formulating their alliances. The two descriptive statements are: 'We mainly consider short-term outcomes during alliance formation' and 'We mainly consider long-term alliance development goal during alliance formation'.

In this item, we asked respondents to select their tendencies on long-term versus short-term perspectives during alliance formation. Scholars found that managers who are able to view their alliances in the context of their firm's industry are likely to develop a high-performing portfolio with a long-term view (Ozcan and Eisenhardt, 2009). This implies that executives with a long-term view are likely to choose a portfolio strategy. Executives with a short-term view are likely to choose a standalone strategy.

However, one may question if the long-term versus the short-term perspectives

when forming alliances are clear, because potentially an alliance can involve short-term projects in order to achieve a long-term objective. Standalone strategy and portfolio strategy may not consistently project short-term and long-term orientation toward alliances. For example, firms may need to form partnerships with other firms to design or supply some components for product testing. Product testing can be just the initial stage of product development to fulfill a long-term goal. These types of alliances can be temporary. If firms have many of these types of alliances, this may impact on how their executives choose their alliance strategies. In order to test if Item 2 has any impact on my regression results and could cause misunderstanding for my respondents, I conducted additional regression analyses without Item 2 for the alliance strategy construct to see if there is any difference in my hypotheses.

I used three sample sizes – 190 firms (all firms), 122 (PCB firms) and 68 (PLAS firms) for the test. In each sample size, there is different validity and reliability for the two-item scale. For the 190 firms (all firms) sample, the average variance extracted is 0.82, and Cronbach's alpha is 0.78. For the 122 firms (PCB firms) sample, the average variance extracted is 0.84, and Cronbach's alpha is 0.81. For the 68 firms (PLAS firms) sample, the average variance extracted is 0.79, and Cronbach's alpha is 0.70.

The regression results of sample size 190 (all firms) show there is no difference in significant hypotheses from my original results in Table 2-3 and 2-4. However, the

control variable of international sales became significant at ($p < 0.1$). The robustness test results without Item 2 are shown in Table 2-12 and Table 2-13.

For the sample size of 122 (PCB firms), the regression results show that age ($p < 0.05$), tenure ($p < 0.1$) and output function ($p < 0.05$) were significantly related to alliance strategy, and only one interactions term (major in business by variable pay) was significant at ($p < 0.05$). The regression results are shown in Table 2-14 and Table 2-15.

For the sample size of 68 (PLAS firms), there was no significant regression result (See Table 2-16). A summarised table of different robustness tests is presented in Table 2-17.

Table 2- 5: Regression Results for the three sub-industrial dummies variables

Dependent Variable	Alliance Strategy				Alliance Strategy			
	Model 1				Model 2			
Control Varaibles	B		SE	Sig	B		SE	Sig
Firm age	.011		.015	.481	.010		.015	.504
Firm size	.000	*	.000	.052	.000		.000	.102
International sales	.014		.009	.135	.013		.009	.163
RD orientation	.186		.275	.499	.218		.292	.457
Alliance Function	1.302	***	.486	.008	1.477	***	.505	.004
Alliance Number	-.012		.013	.360	-.014		.013	.291
Past performance	.182	***	.065	.006	.159	**	.067	.019
Equipment& Machinery	-1.274	**	.635	.046	-1.673	**	.661	.012
Raw Material & Chemical	-1.755	**	.797	.029	-2.062	**	.815	.012
Others	-1.582	**	.796	.048	-1.932	**	.822	.020
Industrial effect (PCB vs PLAS)	1.572	***	.573	.007	1.092	*	.627	.083
Country effect	.290		.966	.764	.432		.982	.661
Independent Varaibles								
Age					-.050		.038	.190
Educational Level					.553		.416	.186
Major in School					-.283		.466	.544
Elite education					-.085		.539	.875
Tenure					.056	*	.029	.054
Functional Background					.580		.493	.241
Constant	8.150		2.034	0.000	8.818		2.918	.003
F Statistics (sig)	5.186 ***				3.867 ***			
R2 square	0.260				0.289			
Adjusted R square	0.210				0.214			
R square change					0.029			
VIF Range	1.161-2.285				1.129-2.493			
Note: N=190								
* p < 0.10, ** p < 0.05, *** p < 0.01								

Table 2- 6: Regression results for the three sub-industrial dummies variables

Dependent Variable	Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy			
	Main Effects (Model 3)				Model 4				Model 5				Model 6				Model 7				Model 8				Model 9			
Control Variables	B		SE	Sig.	B		SE	Sig.	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.010		.016	.536	.010		.016	.530	.009		.016	.561	.009		.015	.562	.009		.016	.583	.009		.160	.546	.006		.016	.695
Firm size	.000		.000	.146	.000		.000	.127	.000		.000	.148	.000		.000	.163	.000		.000	.137	.000		.000	.160	.000		.000	.108
International sales	.013		.010	.176	.014		.010	.154	.014		.010	.166	.013		.009	.167	.014		.010	.159	.013		.010	.173	.016		.010	.103
RD orientation	.294		.301	.329	.316		.303	.300	.281		.305	.357	.317		.299	.290	.295		.302	.330	.296		.302	.329	.382		.304	.210
Alliance Function	1.480	***	.506	.004	1.432	***	.513	.006	1.496	***	.510	.004	1.575	***	.505	.002	1.494	***	.508	.004	1.490	***	.508	.004	1.429	***	.504	.005
Alliance Number	-.014		.013	.293	-.014		.013	.297	-.015		.013	.280	-.014		.013	.286	-.015		.013	.275	-.014		.013	.302	-.015		.013	.272
Past performance	.157	**	.067	.021	.150	**	.068	.029	.159	**	.068	.020	.171	**	.067	.012	.157	**	.068	.021	.161	**	.068	.019	.146	**	.067	.031
Equipment& Machinery	-1.563	**	.668	.020	-1.592	**	.670	.019	-1.596	**	.677	.020	-1.477	**	.664	.027	-1.583	**	.671	.019	-1.554	**	.670	.021	-1.596	**	.664	.017
Raw Material & Chemical	-2.011	**	.821	.015	-2.117	**	.839	.013	-2.006	**	.823	.016	-2.016	**	.815	.014	-1.991	**	.824	.017	-1.983		.825	.017	-2.121	***	.819	.010
Others	-1.878	**	.832	.025	-1.881	**	.834	.025	-1.941	**	.857	.025	-1.773	**	.828	.034	-1.868	**	.835	.027	-1.914		.838	.024	-2.015	**	.832	.016
PCB vs Plastic	1.121	*	.646	.085	1.052		.656	.110	1.102	*	.650	.092	1.044		.642	.106	1.087	*	.652	.097	1.168	*	.656	.077	1.059		.643	.102
Country effect	.545		1.007	.589	.617		1.015	.544	.584		1.017	.566	.217		1.013	.831	.573		1.011	.572	.525		1.010	.604	.626		1.002	.533
Independent variables																												
Age	-.046		.038	.222	-.042		.039	.283	-.046		.038	.222	-.044		.038	.243	-.045		.038	.243	-.049		.038	.206	-.053		.038	.165
Level of education	.670		.427	.119	.689		.429	.110	.663		.429	.124	.574		.427	.180	.671		.428	.119	.667		.428	.121	.605		.426	.157
Major in business	-.311		.469	.508	-.312		.470	.507	-.303		.471	.521	-.332		.466	.477	-.326		.471	.490	-.317		.470	.502	-.263		.467	.574
Elite education	-.034		.541	.950	-.007		.544	.990	-.035		.542	.949	.060		.539	.911	-.039		.542	.943	-.049		.543	.928	-.048		.538	.929
Tenure	.052	*	.030	.082	.053	*	.030	.080	.052	*	.030	.083	.052	*	.030	.083	.053	*	.030	.081	.052	*	.030	.084	.056	*	.030	.061
Functional background	.566		.495	.254	.581		.496	.243	.597		.505	.239	.646		.492	.192	.608		.504	.229	.573		.496	.250	.545		.492	.270
Moderators																												
Variable pay	-.010		.009	.238	-.011		.009	.208	-.011		.009	.222	.000		.010	.970	-.014		.012	.244	-.010		.009	.284	.000		.011	.977
Shareholdings	.217		.894	.808	.182		.898	.839	.219		.897	.807	.133		.888	.881	.182		.900	.840	.256		.901	.777	.284		.890	.750
Interactions																												
Age X Variable pay					.141		.222	.525																				
Educational level X Variable pay									.065		.203	.748																
Major in school X Variable pay													-.904	*	.470	.056												
Elite education X Variable pay																	.210		.457	.646								
Tenure x Variable pay																					-.088		.198	.657				
Output Functional Background x Variable pay																									-.831	*	.484	.088
Age X Shareholdings																												
Educational level X Shareholdings																												
Major in school X Shareholdings																												
Elite education X Shareholdings																												
Tenure x Shareholdings																												
Output Functional Background x Shareholdings																												
Constant	8.040		2.996	0.008	7.746		3.036	0.012	8.099		3.009	0.008	7.662		2.979	.011	8.063		3.003	.008	8.013		3.004	.008	7.822		2.981	.009
F statistics (sig)	3.549 ***				3.388***				3.367***				3.611***				3.375***				3.374***				3.560***			
R square	0.296				0.297				0.296				0.311				0.297				0.297				0.308			
Adjusted R square	0.212				0.210				0.208				0.225				0.209				0.209				0.221			
R square change	0.007				0.020				0.000				0.015				0.001				0.001				0.012			
VIF Range	1.142-2.537				1.142-2.548				1.146-2.596				1.143-2.548				1.147-2.547				1.143-2.539				1.146-2.539			
Note: N=190																												
* p < 0.10, ** p < 0.05, *** p < 0.01																												

Dependent Variable	Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy			
	Model 10				Model 11				Model 12				Model 13				Model 14				Model 15			
Control Variables	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.009		.016	.562	.008		.016	.616	.009		.016	.558	.010		.015	.537	.008		.016	.607	.009		.016	.566
Firm size	.000		.000	.201	.000		.000	.174	.000		.000	.148	.000		.000	.108	.000		.000	.185	.000		.000	.165
International sales	.012		.010	.198	.014		.010	.153	.013		.010	.183	.014		.010	.145	.013		.010	.169	.013		.010	.188
RD orientation	.325		.306	.290	.287		.300	.340	.291		.301	.335	.297		.300	.324	.315		.303	.300	.288		.302	.341
Alliance Function	1.462	***	.508	.005	1.481	***	.505	.004	1.526	***	.511	.003	1.437	***	.506	.005	1.478	***	.507	.004	1.497	***	.509	.004
Alliance Number	-.015		.013	.271	-.016		.013	.244	-.014		.013	.302	-.014		.013	.282	-.015		.013	.260	-.014		.013	.289
Past performance	.156	**	.068	.022	.150	**	.067	.027	.150	**	.068	.029	.147	**	.068	.031	.157	**	.067	.021	.155	**	.068	.024
Equipment& Machinery	-1.525	**	.672	.025	-1.502	**	.668	.026	-1.564	**	.669	.021	-1.518	**	.666	.024	-1.518	**	.672	.025	-1.551	**	.670	.022
Raw Material & Chemical	-1.981	**	.824	.017	-2.011	**	.819	.015	-2.052	**	.824	.014	-1.959	**	.819	.018	-1.969	**	.824	.018	-1.003	**	.823	.016
Others	-1.814	**	.841	.032	-1.968	**	.833	.019	-1.822	**	.838	.031	-1.964	**	.832	.019	-1.823	**	.838	.031	-1.880	**	.835	.026
PCB vs Plastic	1.119	*	.647	.086	1.179	*	.646	.070	1.098	*	.648	.092	1.228	*	.648	.060	1.083	*	.649	.097	1.115	*	.648	.087
Country effect	.621		1.017	.543	.780		1.020	.446	.569		1.009	.574	.550		1.004	.585	.602		1.012	.553	.577		1.012	.569
Independent variables																								
Age	-.043		.038	.260	-.042		.038	.272	-.046		.038	.226	-.041		.038	.285	-.044		.038	.244	-.048		.038	.210
Level of education	.688		.429	.111	.658		.426	.124	.677		.428	.115	.688		.426	.108	.727		.436	.101	.688		.430	.112
Major in business	-.303		.470	.520	-.324		.468	.489	-.312		.470	.508	-.316		.468	.500	-.302		.470	.521	-.316		.470	.503
Elite education	-.042		.542	.939	-.028		.540	.959	-.036		.542	.947	-.107		.542	.843	-.043		.542	.937	-.033		.542	.952
Tenure	.048		.031	.119	.041		.031	.186	.055	*	.030	.070	.048		.030	.108	.047	*	.031	.099	.053	*	.030	.081
Functional background	.584		.497	.241	.641		.497	.199	.592		.497	.235	.616		.494	.214	.558		.496	.262	.550		.497	.270
Moderators																								
Variable pay	-.010		.009	.231	-.011		.009	.211	-.010		.009	.251	-.010		.009	.234	-.011		.009	.213	-.010		.009	.264
Shareholdings	.240		.897	.789	.196		.892	.826	-.203		1.083	.851	1.066		1.073	.322	.136		.904	.880	.467		1.078	.666
Interactions																								
Age X Variable pay																								
Educational level X Variable pay																								
Major in school X Variable pay																								
Elite education X Variable pay																								
Tenure x Variable pay																								
Output Functional background x Variable pay																								
Age X Shareholdings	.133		.226	.558																				
Educational level X Shareholdings					-.294		.219	.182																
Major in school X Shareholdings									.323		.468	.491												
Elite education X Shareholdings													-.673		.473	.157								
Tenure x Shareholdings																	.148		.219	.498				
Output Functional background x Shareholdings																					-.199		.476	.677
Constant	7.654		3.073	.014	7.851		2.992	.009	8.179		3.007	.007	7.584		3.004	.013	7.690		3.045	.012	8.046		3.003	.008
F statistics (sig)	3.384***				3.482***				3.393***				3.497***				3.392 ***				3.372***			
R square	0.297				0.303				0.298				0.304				0.298				0.297			
Adjusted R square	0.209				0.216				0.210				0.217				0.210				0.209			
R square change	0.001				0.007				0.002				0.008				0.002				0.001			
VIF Range	1.143-2.561				1.143-2.549				1.142-2.537				1.142-2.542				1.143-2.562				1.143-2.542			
Note: N=190																								
* p < 0.10, ** p < 0.05, *** p < 0.01																								

Table 2- 7: Regression results 1 for PCB industry (122 firms)

Dependent Variable	Alliance Strategy				Alliance Strategy			
	Model 1				Model 2			
Control Varaibles	B		SE	Sig	B		SE	Sig
Firm age	.008		.018	.654	.013		.018	.452
Firm size	.000		.000	.103	.000		.000	.229
International sales	.016		.010	.125	.014		.010	.156
RD orientation	.246		.311	.431	.416		.333	.214
Alliance Function	1.709	***	.617	.007	2.009	***	.639	.002
Alliance Number	-.021		.027	.426	-.028		.027	.296
Past performance	.283	***	.076	.000	.202	**	.079	.012
Industry effect 1	1.264	**	.626	.046	1.939	***	.655	.004
Country effect	.090		1.008	.929	.335		1.005	.740
Independent Varaibles								
Age					-.101	**	.045	.026
Educational Level					.567		.505	.264
Major in School					.120		.625	.847
Elite education					.106		.680	.876
Tenure					.062	*	.035	.077
Functional Background					1.134		.605	.112
Constant	6.188		1.884	0.001	7.954		3.112	.012
F Statistics (sig)	5.854 ***				4.552 ***			
R square	0.320				0.392			
Adjusted R square	0.265				0.306			
R square change					0.072			
VIF Range	1.130-1.726				1.187-1.857			
Note: N=122								
* p < 0.10, ** p < 0.05, *** p < 0.01								

Table 2- 8: Regression results 1 for PCB industry (122 firms)

Dependent Variable	Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy			
	Main Effects (Model 3)				Model 4				Model 5				Model 6				Model 7				Model 8				Model 9			
Control Variables	B		SE	Sig.	B		SE	Sig.	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.014		.018	.455	.014		.018	.458	.012		.018	.513	.014		.018	.449	.012		.018	.515	.013		.018	.480	.011		.018	.560
Firm size	.000		.000	.281	.000		.000	.293	.000		.000	.285	.000		.000	.348	.000		.000	.264	.000		.000	.339	.000		.000	.243
International sales	.014		.010	.161	.014		.010	.173	.016		.010	.132	.015		.010	.132	.015		.010	.150	.014		.010	.158	.017	*	.010	.095
RD orientation	.480		.345	.167	.478		.348	.173	.444		.348	.205	.509		.340	.137	.478		.346	.171	.488		.345	.160	.604	*	.352	.090
Alliance Function	2.024	***	.642	.002	2.028	***	.653	.002	2.098	***	.649	.002	2.230	***	.642	.001	2.038	***	.646	.002	2.070	***	.644	.002	2.005	***	.639	.002
Alliance Number	-.027		.027	.320	-.027		.027	.322	-.028		.027	.309	-.032		.027	.245	-.027		.027	.330	-.027		.027	.322	-.030		.027	.264
Past performance	.203	**	.079	.012	.203	**	.081	.013	.208	**	.080	.011	.231	***	.080	.005	.204	**	.080	.012	.215	**	.080	.009	.190	**	.079	.019
Industry effect 1	1.846	***	.666	.007	1.843	**	.673	.007	1.913	**	.672	.005	1.717	**	.660	.011	1.837	**	.669	.007	1.848	***	.666	.007	1.906	***	.663	.005
Country effect	.358		1.036	.730	.355		1.045	.735	.471		1.047	.654	-.068		1.043	.948	.388		1.043	.710	.299		1.038	.774	.437		1.031	.673
Independent variables																												
Age	-.096	**	.045	.035	-.097	**	.046	.040	-.096	**	.045	.036	-.093	**	.045	.039	-.094	**	.046	.043	-.103	**	.046	.026	-.106	**	.045	.022
Level of education	.654		.516	.207	.653		.519	.211	.636		.517	.222	.517		.513	.316	.649		.518	.213	.650		.515	.210	.616		.513	.232
Major in business	.096		.633	.880	.095		.637	.882	.090		.634	.887	-.070		.630	.911	.074		.638	.908	.042		.635	.947	.147		.630	.816
Elite education	.148		.686	.829	.145		.694	.835	.140		.688	.839	.242		.678	.721	.154		.689	.823	.083		.689	.904	.138		.682	.840
Tenure	.057	*	.036	.091	.057	*	.037	.080	.059	*	.036	.061	.056	*	.036	.046	.058	*	.037	.072	.060	*	.036	.061	.061	*	.036	.094
Functional background	1.092		.613	.102	1.091		.616	.123	1.177		.622	.111	1.226		.608	.124	1.130		.622	.116	1.170		.617	.105	.991		.612	.109
Moderators																												
Variable pay	-.008		.009	.406	-.008		.009	.418	-.010		.010	.297	.004		.011	.708	-.012		.013	.378	-.006		.010	.564	.002		.011	.879
Shareholdings	.414		1.041	.691	.416		1.047	.692	.402		1.043	.700	.431		1.027	.675	.374		1.050	.722	.481		1.043	.646	.478		1.036	.645
Interactions																												
Age X Variable pay					-.010		.239	.968																				
Educational level X Variable pay									.178		.214	.406																
Major in school X Variable pay													-1.038	**	.516	.047												
Elite education X Variable pay																	.210		.490	.668								
Tenure x Variable pay																					-.221		.216	.309				
Output Functional Background x Variable pay																									-.801		.527	.132
Age X Shareholdings																												
Educational level X Shareholdings																												
Major in school X Shareholdings																												
Elite education X Shareholdings																												
Tenure x Shareholdings																												
Output Functional Background x Shareholdings																												
Constant	7.296		3.200	0.025	7.327		3.304	0.029	7.286		3.205	0.025	6.709		3.168	.037	7.250		3.215	.026	7.304		3.200	.025	6.908		3.191	.033
F statistics (sig)	4.031 ***				3.771***				3.835***				4.143***				3.788***				3.867***				3.983***			
R square	0.397				0.397				0.401				0.420				0.398				0.403				0.410			
Adjusted R square	0.299				0.292				0.297				0.319				0.293				0.299				0.307			
R square change	0.005				0.000				0.004				0.023				0.001				0.006				0.013			
VIF Range	1.202-1.890				1.204-1.891				1.272-1.892				1.223-1.902				1.210-2.549				1.210-1.890				1.206-1.902			
Note: N=122																												
* p < 0.10, ** p < 0.05, *** p < 0.01																												

Dependent Variable	Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy			
	Model 10				Model 11				Model 12				Model 13				Model 14				Model 15			
Control Variables	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.014		.018	.460	.012		.018	.525	.013		.018	.462	.013		.018	.461	.012		.019	.512	.014		.018	.454
Firm size	.000		.000	.294	.000		.000	.299	.000		.000	.282	.000		.000	.245	.000		.000	.315	.000		.000	.280
International sales	.014		.010	.167	.015		.010	.144	.014		.010	.165	.015		.010	.138	.014		.010	.165	.014		.010	.161
RD orientation	.479		.351	.176	.484		.344	.162	.470		.347	.179	.485		.345	.163	.493		.349	.160	.483		.348	.167
Alliance Function	2.026	***	.653	.002	1.989	***	.642	.002	2.059	***	.650	.002	1.994	***	.644	.003	2.003	***	.648	.003	2.020	***	.646	.002
Alliance Number	-.027		.027	.323	-.027		.027	.321	-.027		.027	.324	-.026		.027	.336	-.028		.027	.311	-.027		.027	.325
Past performance	.203	**	.080	.013	.197	**	.079	.015	.197	**	.081	.017	.195	**	.080	.017	.203	**	.080	.012	.204	**	.080	.013
Industry effect 1	1.848	***	.676	.007	1.819	***	.665	.007	1.851	***	.669	.007	1.835	**	.667	.007	1.821	***	.673	.008	1.849	**	.670	.007
Country effect	.355		1.053	.737	.569		1.049	.589	.368		1.041	.725	.331		1.038	.750	.405		1.050	.700	.347		1.045	.740
Independent variables																								
Age	-.097	**	.047	.042	-.090	*	.045	.051	-.096	**	.045	.036	-.090	*	.046	.051	-.095	**	.046	.041	-.096	**	.046	.038
Level of education	.653		.520	.212	.623		.515	.229	.659		.518	.206	.702		.519	.179	.695		.532	.194	.649		.519	.214
Major in business	.095		.637	.881	.077		.632	.903	.144		.646	.824	.072		.634	.909	.102		.636	.872	.095		.636	.882
Elite education	.149		.690	.830	.171		.685	.804	.153		.689	.824	.029		.700	.968	.153		.690	.825	.147		.690	.832
Tenure	.057	*	.037	.080	.046	*	.037	.063	.058	*	.037	.074	.052	*	.037	.066	.056	*	.037	.081	.057	*	.037	.080
Functional background	1.091		.617	.128	1.152		.613	.221	1.114		.617	.115	1.146		.616	.157	1.085		.616	.130	1.107		.626	.123
Moderators																								
Variable pay	-.008		.009	.409	-.009		.009	.361	-.008		.009	.418	-.008		.009	.404	-.008		.009	.383	-.008		.009	.402
Shareholdings	.416		1.049	.692	.375		1.040	.719	.143		1.230	.908	1.165		1.337	.385	.283		1.117	.801	.315		1.291	.808
Interactions																								
Age X Variable pay																								
Educational level X Variable pay																								
Major in school X Variable pay																								
Elite education X Variable pay																								
Tenure x Variable pay																								
Output Functional background x Variable pay																								
Age X Shareholdings	-.006		.267	.981																				
Educational level X Shareholdings					-.289		.240	.232																
Major in school X Shareholdings									.241		.574	.676												
Elite education X Shareholdings													-.485		.541	.372								
Tenure x Shareholdings																	.091		.272	.738				
Output Functional background x Shareholdings																					.074		.560	.896
Constant	7.320		3.361	.032	7.096		3.198	.029	7.436		3.323	.023	6.856		3.241	.037	7.036		3.306	.036	7.247		3.220	.026
F statistics (sig)	3.771***				3.904***				3.787***				3.845***				3.781 ***				3.772***			
R square	0.397				0.406				0.398				0.402				0.398				0.397			
Adjusted R square	0.292				0.302				0.293				0.297				0.293				0.292			
R square change	0.000				0.008				0.001				0.005				0.001				0.000			
VIF Range	1.204-1.905				1.161-1.890				1.217-1.1891				1.204-2.177				1.203-1.901				1.203-1.893			
Note: N=122																								
* p < 0.10, ** p < 0.05, *** p < 0.01																								

Table 2- 9: Regression results 2 for PCB industry (122 firms)

Dependent Variable	Alliance Strategy				Alliance Strategy			
	Model 1				Model 2			
Control Varaibles	B		SE	Sig	B		SE	Sig
Firm age	.009		.018	.627	.015		.018	.419
Firm size	.000		.000	.126	.000		.000	.275
International sales	.014		.010	.178	.013		.010	.203
RD orientation	.149		.322	.644	.324		.340	.343
Alliance Function	1.662	***	.625	.009	1.900	***	.649	.004
Alliance Number	-.022		.027	.407	-.030		.027	.270
Past performance	.275	***	.077	.001	.192	**	.080	.018
Equipment& Machinery	-.880		.703	.214	-1.540	**	.719	.035
Raw Material & Chemical	-2.078	**	1.028	.046	-2.701	**	1.052	.012
Others	-1.630	*	.928	.082	-2.537	**	.953	.009
Country effect	.273		1.021	.790	.579		1.022	.572
Independent Varaibles								
Age					-.106	**	.045	.020
Educational Level					.643		.511	.211
Major in School					.165		.628	.793
Elite education					.067		.690	.923
Tenure					.061	*	.035	.082
Functional Background					1.027		.611	.101
Constant	8.103		2.131	0.000	10.647		3.260	.001
F Statistics (sig)	4.905 ***				4.119 ***			
R2 square	0.329				0.402			
Adjusted R square	0.262				0.305			
R square change					0.073			
VIF Range	1.217-1.589				1.194-1.863			
Note: N=122								
* p < 0.10, ** p < 0.05, *** p < 0.01								

Table 2- 10: Regression results 2 for PCB industry (122 firms)

Dependent Variable	Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy			
	Main Effects (Model 3)				Model 4				Model 5				Model 6				Model 7				Model 8				Model 9			
Control Variables	B		SE	Sig.	B		SE	Sig.	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.014		.018	.428	.014		.018	.429	.012		.018	.499	.014		.018	.417	.014		.019	.461	.013		.018	.461	.011		.018	.536
Firm size	.000		.000	.340	.000		.000	.340	.000		.000	.338	.000		.000	.421	.000		.000	.334	.000		.000	.408	.000		.000	.298
International sales	.013		.010	.215	.013		.011	.217	.015		.011	.169	.014		.010	.184	.013		.011	.213	.013		.010	.203	.016		.010	.126
RD orientation	.394		.350	.263	.397		.353	.263	.354		.354	.320	.421		.345	.225	.395		.352	.264	.398		.350	.258	.521		.355	.146
Alliance Function	1.907	***	.651	.004	1.897	***	.662	.005	1.970	***	.656	.003	2.120	***	.650	.002	1.915	***	.656	.004	1.940	***	.651	.004	1.873	***	.646	.005
Alliance Number	-.029		.027	.287	-.029		.027	.289	-.030		.027	.283	-.034		.027	.213	-.029		.027	.294	-.029		.027	.293	-.033		.027	.227
Past performance	.192	**	.080	.018	.190	**	.082	.021	.199	**	.081	.015	.220	***	.080	.007	.193	**	.081	.019	.206	**	.081	.012	.177	**	.080	.029
Equipment& Machinery	-1.412	*	.733	.057	-1.416	*	.738	.058	-1.496	**	.741	.046	-1.262	*	.726	.085	-1.419	*	.738	.057	-1.405	*	.733	.058	-1.429	*	.727	.052
Raw Material & Chemical	-2.616	**	1.070	.016	-2.644	**	1.106	.019	-2.515	**	1.078	.022	-2.567	**	1.054	.017	-2.586	**	1.088	.019	-2.512	**	1.073	.021	-2.765	**	1.065	.011
Others	-2.486	**	.964	.011	-2.486	**	.969	.012	-2.694	**	.995	.008	-2.336	**	.952	.016	-2.474	**	.971	.012	-2.621	***	.971	.008	-2.634	***	.960	.007
Country effect	.642		1.060	.546	.656		1.073	.542	.735		1.067	.493	.226		1.063	.832	.647		1.065	.545	.566		1.061	.595	.761		1.053	.472
Independent variables																												
Age	-.102	**	.045	.027	-.101	**	.047	.034	-.102		.045	.027	-.098	**	.045	.030	-.100	**	.046	.032	-.110	**	.046	.019	-.113	**	.045	.015
Level of education	.743		.522	.158	.748		.527	.159	.708		.525	.180	.611		.518	.241	.738		.526	.163	.730		.522	.165	.711		.518	.173
Major in business	.134		.638	.833	.136		.641	.833	.146		.639	.819	-.040		.633	.950	.125		.643	.846	.091		.638	.886	.196		.633	.757
Elite education	.120		.695	.864	.126		.701	.858	.139		.696	.842	.206		.686	.764	.124		.699	.859	.069		.696	.921	.106		.689	.878
Tenure	.057		.036	.123	.057		.037	.125	.059	*	.036	.093	.055	*	.036	.077	.057		.037	.122	.060	*	.036	.093	.061	*	.036	.092
Functional background	.969		.620	.121	.971		.623	.123	1.074		.633	.111	1.098		.614	.125	.989		.633	.121	1.061		.625	.103	.844		.619	.176
Moderators																												
Variable pay	-.009		.009	.338	-.009		.010	.338	-.011		.010	.243	.003		.011	.784	-.011		.014	.428	-.006		.010	.503	.001		.011	.907
Shareholdings	.353		1.068	.741	.345		1.076	.749	.402		1.071	.708	.349		1.051	.740	.340		1.075	.752	.473		1.072	.660	.419		1.059	.693
Interactions																												
Age X Variable pay					.026		.245	.915																				
Educational level X Variable pay									.192		.224	.394																
Major in school X Variable pay													-1.061	**	.516	.043												
Elite education X Variable pay																	.091		.499	.856								
Tenure x Variable pay																					-.243		.220	.272				
Output Functional Background x Variable pay																									-.885	*	.528	.097
Age X Shareholdings																												
Educational level X Shareholdings																												
Major in school X Shareholdings																												
Elite education X Shareholdings																												
Tenure x Shareholdings																												
Output Functional Background x Shareholdings																												
Constant	9.872		3.355	0.004	9.798		3.442	0.005	9.957		3.360	0.004	9.155		3.321	.007	9.834		3.377	.004	9.946		3.352	.004	9.598		3.329	.005
F statistics (sig)	3.714 ***				3.494***				3.555***				3.850***				3.496***				3.579***				3.731***			
R square	0.409				0.409				0.413				0.433				0.409				0.416				0.425			
Adjusted R square	0.299				0.292				0.297				0.320				0.292				0.300				0.311			
R square change	0.007				0.000				0.004				0.024				0.000				0.007				0.016			
VIF Range	1.230-1.902				1.376-1.903				1.220-1.903				1.242-1.916				1.228-2.559				1.222-1.903				1.224-1.832			
Note: N=122																												
* p < 0.10, ** p < 0.05, *** p < 0.01																												

Dependent Variable	Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy				Alliance Strategy			
	Model 10				Model 11				Model 12				Model 13				Model 14				Model 15			
Control Variables	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.015		.018	.427	.012		.018	.510	.014		.018	.434	.014		.018	.434	.013		.019	.496	.014		.018	.427
Firm size	.000		.000	.343	.000		.000	.375	.000		.000	.341	.000		.000	.292	.000		.000	.387	.000		.000	.337
International sales	.013		.011	.217	.014		.010	.192	.013		.010	.220	.014		.010	.180	.013		.010	.222	.013		.010	.215
RD orientation	.388		.357	.281	.382		.348	.275	.388		.352	.274	.392		.350	.265	.409		.353	.250	.398		.353	.262
Alliance Function	1.917	***	.661	.005	1.833	***	.649	.006	1.939	***	.661	.004	1.856	***	.653	.005	1.879	***	.657	.005	1.903	***	.655	.005
Alliance Number	-.029		.027	.291	-.029		.027	.283	-.029		.027	.290	-.028		.027	.303	-.030		.028	.275	-.029		.027	.292
Past performance	.192	**	.080	.019	.183	**	.080	.024	.187	**	.082	.024	.182	**	.081	.026	.193	**	.080	.018	.193	**	.081	.019
Equipment& Machinery	-1.420	*	.741	.058	-1.296	*	.733	.080	-1.423	*	.737	.056	-1.364	*	.734	.066	-1.370	*	.743	.068	-1.416	*	.737	.058
Raw Material & Chemical	-2.622	**	1.077	.017	-2.665	**	1.064	.014	-2.623	**	1.075	.016	-2.621	**	1.070	.016	-2.604	**	1.075	.017	-2.621	**	1.076	.017
Others	-2.503	**	.983	.012	-2.634	***	.963	.007	-2.468	**	.970	.012	-2.568	***	.966	.009	-2.464	**	.969	.013	-2.491	**	.969	.012
Country effect	.626		1.076	.562	.954		1.074	.376	.647		1.065	.545	.627		1.059	.556	.710		1.076	.511	.630		1.068	.557
Independent variables																								
Age	-.103	**	.047	.032	-.095	**	.045	.039	-.101	**	.046	.028	-.095	**	.046	.040	-.100	**	.046	.032	-.101	**	.046	.030
Level of education	.739		.527	.164	.715		.520	.172	.747		.525	.158	.804		.525	.129	.799		.540	.142	.738		.526	.164
Major in business	.133		.641	.836	.126		.634	.843	.170		.649	.794	.115		.637	.858	.143		.640	.824	.133		.641	.836
Elite education	.122		.699	.862	.153		.691	.825	.122		.698	.862	-.019		.706	.979	.124		.698	.859	.118		.698	.867
Tenure	.057		.037	.126	.043	*	.037	.100	.058		.037	.119	.051		.037	.165	.055		.037	.134	.057		.037	.125
Functional background	.965		.624	.125	1.026		.618	.252	.987		.625	.117	1.027		.622	.102	.957		.623	.128	.987		.633	.122
Moderators																								
Variable pay	-.009		.009	.343	-.010		.009	.278	-.009		.009	.348	-.009		.009	.332	-.010		.010	.310	-.009		.009	.334
Shareholdings	.363		1.077	.737	.316		1.061	.766	.135		1.261	.915	1.267		1.367	.356	.179		1.144	.876	.238		1.313	.857
Interactions																								
Age X Variable pay																								
Educational level X Variable pay																								
Major in school X Variable pay																								
Elite education X Variable pay																								
Tenure x Variable pay																								
Output Functional background x Variable pay																								
Age X Shareholdings	-.028		.269	.919																				
Educational level X Shareholdings					-.366		.244	.137																
Major in school X Shareholdings									.189		.577	.743												
Elite education X Shareholdings													-.583		.545	.287								
Tenure x Shareholdings																	.119		.272	.664				
Output Functional background x Shareholdings																					.085		.560	.879
Constant	9.987		3.553	.006	9.747		3.335	.004	9.971		3.383	.004	9.407		3.380	.006	9.515		3.466	.007	9.852		3.373	.004
F statistics (sig)	3.494***				3.684***				3.502***				3.590***				3.509 ***				3.495***			
R square	0.409				0.422				0.410				0.416				0.410				0.409			
Adjusted R square	0.292				0.307				0.293				0.300				0.293				0.292			
R square change	0.000				0.013				0.001				0.007				0.001				0.000			
VIF Range	1.220-1.933				1.208-2.902				1.233-1.902				1.220-1.904				1.221-1.914				1.220-2.085			
Note: N=122																								
* p < 0.10, ** p < 0.05, *** p < 0.01																								

Table 2- 11: Regression results for PLAS industry (68 firms)

Dependent Variable	Alliance Strategy			Alliance Strategy		
	Model 1			Model 2		
Control Varaibles	B	SE	Sig	B	SE	Sig
Firm age	-.003	.031	.915	-.016	.034	.632
Firm size	.000	.001	.826	.000	.001	.831
International sales	.003	.027	.915	.008	.028	.778
RD orientation	.278	.579	.633	.203	.590	.732
Alliance Function	.478	.788	.547	.248	.796	.757
Alliance Number	-.005	.016	.760	-.010	.018	.575
Past performance	-.193	.125	.127	-.167	.127	.193
Country effect	-.584	1.858	.754	-.162	1.879	.931
Independent Varaibles						
Age				.096	.068	.164
Educational Level				.393	.740	.597
Major in School				-.956	.664	.156
Elite education				-.080	.847	.925
Tenure				.001	.051	.989
Functional Background				-.303	.753	.689
Constant	15.598	3.641	0.000	10.019	5.738	.087
F Statistics (sig)	0.375			0.742		
R square	0.048			0.164		
Adjusted R square	-0.081			-0.057		
R square change				0.115		
VIF Range	1.106-1.966			1.295-2.390		
Note: N=68						
* p < 0.10, ** p < 0.05, *** p < 0.01						

Table 2- 12: Regression results for Alliance strategy with 2-item scale (N= 190)

Dependent Variable	Alliance Strategy 2i				Alliance Strategy 2i			
	Model 1				Model 2			
Control Varaibles	B		SE	Sig	B		SE	Sig
Firm age	.012		.011	.259	.011		.011	.288
Firm size	.000	**	.000	.029	.000	*	.000	.075
International sales	.012	*	.006	.072	.011	*	.007	.098
RD orientation	.157		.191	.410	.195	*	.203	.337
Alliance Function	.788	**	.342	.023	.964	***	.352	.007
Alliance Number	-.009		.009	.330	-.011		.009	.239
Past Performance	.147	***	.046	.002	.129	***	.047	.006
Industry effect 1	1.319	***	.412	.002	1.566	***	.429	.000
Industry effect 2	.536		.394	.175	.166		.426	.697
Country effect	.358		.618	.564	.492		.624	.432
Independent Varaibles								
Age					-.039		.026	.142
Educational Level					.396		.292	.176
Major in School					-.421		.326	.198
Elite education					-.061		.377	.871
Tenure					.039	*	.020	.054
Functional Background					.514		.340	.133
Constant	3.620		1.255	0.004	3.950	1.9	1.036	0.042
F Statistics (sig)	6.293 ***				4.577***			
R2 square	0.260				0.297			
Adjusted R square	0.219				0.232			
R square change					0.037			
VIF Range	1.117-1.633				1.123-1.946			
Note: N = 190								
* p < 0.10, ** p < 0.05, *** p < 0.01								

Table 2- 13: Regression results for Alliance strategy with 2-item scale (N= 190)

Dependent Variable	Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i			
	Main Effects (Model 3)				Model 4				Model 5				Model 6				Model 7				Model 8				Model 9			
Control Variables	B		SE	Sig.	B		SE	Sig.	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.011		.011	.319	.011		.011	.318	.010		.011	.341	.010		.011	.347	.010		.011	.371	.011		.011	.323	.009		.011	.431
Firm size	.000		.000	.102	.000		.000	.086	.000		.000	.104	.000		.000	.114	.000		.000	.092	.000		.000	.111	.000	*	.000	.073
International sales	.011		.007	.105	.011		.007	.087	.011	*	.007	.094	.011	*	.006	.098	.011	*	.007	.088	.011		.007	.105	.013	*	.007	.057
RD orientation	.245		.209	.243	.258	**	.210	.221	.234		.211	.268	.260		.207	.212	.245		.209	.244	.247		.210	.240	.308		.211	.147
Alliance Function	.969	***	.353	.007	.930	**	.358	.010	.987	***	.356	.006	1.046	***	.352	.003	.980	***	.354	.006	.977	***	.355	.007	.940	***	.352	.008
Alliance Number	-.011		.009	.230	-.011		.009	.233	-.012		.009	.212	-.011		.009	.224	-.012		.009	.207	-.011		.009	.237	-.012		.009	.210
Past performance	.128	***	.047	.007	.124		.047	.010	.129	***	.047	.007	.140	***	.047	.003	.128	***	.047	.007	.130	***	.047	.007	.121	**	.047	.011
Industry effect 1	1.517	***	.432	.001	1.549		.435	.000	1.550	***	.438	.001	1.459	***	.429	.001	1.522	***	.433	.001	1.515	***	.433	.001	1.569	***	.431	.000
Industry effect 2	.156		.439	.723	.104		.446	.817	.131		.443	.768	.106		.435	.807	.127		.442	.774	.178		.445	.689	.095		.439	.828
Country effect	.553		.634	.385	.592		.638	.354	.586		.639	.360	.344		.635	.589	.578		.636	.365	.546		.636	.392	.561		.631	.375
Independent variables																												
Age	-.037		.026	.166	-.033		.027	.222	-.037		.026	.166	-.035		.026	.180	-.035		.027	.189	-.038		.027	.157	-.041		.026	.126
Level of education	.464		.299	.123	.477		.300	.114	.459		.300	.129	.388		.299	.195	.466		.300	.122	.463		.300	.125	.418		.299	.164
Major in business	-.443		.328	.179	-.440		.328	.182	-.438		.329	.185	-.454		.325	.164	-.457		.329	.167	-.448		.329	.175	-.413		.327	.209
Elite education	-.033		.379	.930	-.011		.381	.978	-.036		.380	.924	.045		.377	.906	-.038		.380	.920	-.043		.381	.911	-.044		.377	.908
Tenure	.038	*	.021	.073	.038		.021	.071	.038	*	.021	.074	.038		.021	.072	.038	*	.021	.071	.038	*	.021	.074	.041	*	.021	.053
Functional background	.508		.342	.139	.525		.343	.128	.538		.348	.124	.573	*	.340	.093	.547		.347	.117	.512		.343	.137	.503		.340	.141
Moderators																												
Variable pay	-.006		.006	.298	-.007		.006	.264	-.007		.006	.259	.002	*	.007	.788	-.010		.008	.224	-.006		.006	.339	.001		.007	.900
Shareholdings	.033		.608	.957	.024		.609	.968	.023		.610	.969	-.030		.603	.961	-.002		.611	.998	.046		.611	.940	.076		.606	.900
Interactions																												
Age X Variable pay					.106		.153	.489																				
Educational level X Variable pay									.068		.139	.626																
Major in school X Variable pay													-.697	**	.327	.034												
Elite education X Variable pay																	.216		.317	.497								
Tenure x Variable pay																					-.049		.137	.722				
Output Functional Background x Variable pay																									-.561	*	.338	.099
Age X Shareholdings																												
Educational level X Shareholdings																												
Major in school X Shareholdings																												
Elite education X Shareholdings																												
Tenure x Shareholdings																												
Output Functional Background x Shareholdings																												
Constant	3.574		1.985	0.074	3.329		2.020	0.101	3.604		1.991	0.072	3.307		1.969	.095	3.607		1.989	.072	3.554		1.991	.076	3.379		1.979	.090
F statistics (sig)	4.110***				3.907***				3.889***				4.214***				3.309***				3.881***				4.097***			
R square	0.302				0.304				0.303				0.320				0.304				0.303				0.313			
Adjusted R square	0.229				0.226				0.225				0.244				0.226				0.225				0.263			
R square change	0.005				0.002				0.001				0.018				0.002				0.001				0.011			
VIF Range	1.133-2.060				1.133-2.120				1.134-2.088				1.133-2.066				1.137-2.210				1.135-2.102				1.136-2.074			
Note: N=190																												
* p < 0.10, ** p < 0.05, *** p < 0.01																												

Dependent Variable	Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i			
	Model 10				Model 11				Model 12				Model 13				Model 14				Model 15			
Control Variables	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.011		.011	.325	.010		.011	.373	.010		.011	.340	.011		.011	.313	.010		.011	.384	.011		.011	.320
Firm size	.000		.000	.118	.000		.000	.121	.000		.000	.103	.000		.000	.072	.000		.000	.137	.000		.000	.104
International sales	.011		.007	.109	.011		.007	.086	.011		.007	.106	.011	*	.007	.086	.011	*	.007	.098	.011		.007	.106
RD orientation	.249		.213	.244	.245		.209	.241	.240		.210	.253	.252		.208	.228	.262		.210	.214	.246		.210	.244
Alliance Function	.966	***	.355	.007	.974	***	.352	.006	.998	***	.356	.006	.944	***	.352	.008	.966	***	.354	.007	.967	***	.355	.007
Alliance Number	-.011		.009	.230	-.012		.009	.184	-.011		.009	.238	-.012		.009	.218	-.012		.009	.197	-.011		.009	.232
Past performance	.128	***	.047	.007	.123	***	.047	.009	.124	***	.047	.010	.120	**	.047	.012	.128	***	.047	.007	.128	***	.047	.007
Industry effect 1	1.513	***	.436	.001	1.509	***	.431	.001	1.517	***	.433	.001	1.503	***	.431	.001	1.480	***	.435	.001	1.518	***	.434	.001
Industry effect 2	.156		.441	.724	.169		.438	.700	.145		.440	.742	.218		.439	.620	.124		.442	.780	.157		.441	.723
Country effect	.560		.640	.383	.691		.640	.282	.545		.635	.392	.579		.632	.361	.581		.636	.362	.549		.640	.392
Independent variables																								
Age	-.036		.027	.176	-.033		.026	.216	-.036		.026	.170	-.032		.026	.223	-.035		.027	.189	-.037		.027	.172
Level of education	.466		.301	.123	.455		.299	.129	.468		.300	.121	.479		.298	.110	.511	*	.305	.096	.462		.302	.128
Major in business	-.442		.329	.181	-.461		.327	.161	-.438		.329	.184	-.455		.327	.165	-.434		.328	.188	-.442		.329	.181
Elite education	-.034		.380	.929	-.034		.378	.929	-.032		.380	.934	-.093		.380	.808	-.040		.380	.916	-.033		.380	.930
Tenure	.037	*	.022	.086	.030		.022	.169	.040	*	.021	.061	.035	*	.021	.096	.033		.022	.127	.038	*	.021	.074
Functional background	.511		.343	.139	.572	*	.344	.098	.530		.344	.125	.548		.341	.111	.503		.342	.144	.510		.344	.140
Moderators																								
Variable pay	-.006		.006	.298	-.007		.006	.271	-.006		.006	.319	-.006		.006	.290	-.007		.006	.264	-.006		.006	.300
Shareholdings	.037		.612	.952	.007		.607	.991	-.253		.727	.729	.637		.724	.380	-.028		.614	.964	.010		.738	.990
Interactions																								
Age X Variable pay																								
Educational level X Variable pay																								
Major in school X Variable pay																								
Elite education X Variable pay																								
Tenure x Variable pay																								
Output Functional background x Variable pay																								
Age X Shareholdings	.016		.158	.922																				
Educational level X Shareholdings					-.212		.152	.165																
Major in school X Shareholdings									.234		.324	.473												
Elite education X Shareholdings													-.501		.329	.130								
Tenure x Shareholdings																	.123		.153	.421				
Output Functional background x Shareholdings																					.019		.335	.955
Constant	3.535		2.030	.083	3.433		1.982	.085	3.695		1.995	.066	3.214		1.992	.108	3.333		2.010	.099	3.574		1.991	.074
F statistics (sig)	3.872***				4.018***				3.910***				4.046***				3.920 ***				3.871***			
R square	0.302				0.310				0.304				0.311				0.305				0.302			
Adjusted R square	0.224				0.233				0.226				0.234				0.227				0.224			
R square change	0.000				0.008				0.002				0.009				0.003				0.000			
VIF Range	1.134-2.060				1.135-2.061				1.113-2.062				1.134-2.078				1.134-2.077				1.134-2.063			
Note: N=190																								
* p < 0.10, ** p < 0.05, *** p < 0.01																								

Table 2- 14: Regression results for Alliance strategy with 2-item scale (N= 122)

Dependent Variable	Alliance Strategy 2i				Alliance Strategy 2i			
	Model 1				Model 2			
Control Varaibles	B		SE	Sig	B		SE	Sig
Firm age	.009		.013	.476	.012		.013	.351
Firm size	.000	*	.000	.093	.000		.000	.275
International sales	.012	*	.007	.099	.011		.007	.123
RD orientation	.165		.228	.470	.294		.244	.231
Alliance Function	1.122	**	.453	.015	1.453	***	.468	.002
Alliance Number	-.017		.020	.386	-.025		.020	.204
Past Performance	.213	***	.056	.000	.162	***	.058	.006
Industry effect 1	1.187	**	.459	.011	1.614	***	.480	.001
Country effect	.441		.740	.552	.644		.735	.383
Independent Varaibles								
Age					-.071	**	.033	.032
Educational Level					.407		.369	.273
Major in School					-.329		.457	.473
Elite education					-.001		.498	.998
Tenure					.044	*	.025	.082
Functional Background					.945	**	.443	.035
Constant	2.784		1.382	0.046	3.916		2.278	0.088
F Statistics (sig)	6.517 ***				5.025***			
R2 square	0.344				0.416			
Adjusted R square	0.291				0.333			
R square change					0.072			
VIF Range	1.130-1.580				1.187-1.857			
Note: N = 122								
* p < 0.10, ** p < 0.05, *** p < 0.01								

Table 2- 15: Regression results for Alliance strategy with 2-item scale (N= 122)

Dependent Variable	Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i			
	Main Effects (Model 3)				Model 4				Model 5				Model 6				Model 7				Model 8				Model 9			
Control Variables	B		SE	Sig.	B		SE	Sig.	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.012		.013	.366	.012		.013	.367	.010		.013	.432	.012		.013	.356	.010		.013	.448	.011		.013	.387	.010		.013	.459
Firm size	.000		.000	.328	.000		.000	.324	.000		.000	.332	.000		.000	.412	.000		.000	.293	.000		.000	.388	.000		.000	.286
International sales	.011		.007	.132	.012		.008	.133	.013		.008	.099	.012		.007	.101	.012		.008	.114	.011		.007	.130	.014	*	.008	.076
RD orientation	.342		.253	.178	.347		.255	.177	.307		.254	.230	.367		.248	.141	.340		.253	.183	.348		.253	.172	.433	*	.258	.097
Alliance Function	1.463	***	.471	.002	1.452	***	.478	.003	1.535	***	.475	.002	1.639	***	.467	.001	1.480	***	.472	.002	1.496	***	.472	.002	1.450	***	.468	.002
Alliance Number	-.025		.020	.215	-.025		.020	.217	-.026		.020	.203	-.029		.020	.148	-.024		.020	.226	-.025		.020	.216	-.027		.020	.173
Past performance	.162	***	.058	.006	.161	***	.059	.007	.167	***	.058	.005	.186	***	.058	.002	.164	***	.058	.006	.171	***	.059	.005	.153	***	.058	.010
Industry effect 1	1.548	***	.488	.002	1.556	***	.493	.002	1.613	***	.491	.001	1.439	***	.480	.003	1.538	***	.490	.002	1.550	***	.488	.002	1.592	***	.486	.001
Country effect	.687		.759	.368	.697		.765	.364	.795		.765	.301	.324		.759	.670	.722		.763	.346	.646		.761	.398	.744		.755	.327
Independent variables																												
Age	-.068	**	.033	.042	-.067	**	.034	.051	-.068	**	.033	.042	-.065	**	.032	.046	-.065	*	.033	.054	-.073	**	.033	.031	-.075	**	.033	.026
Level of education	.468		.378	.219	.470		.380	.219	.450		.378	.236	.351		.373	.349	.461		.379	.226	.464		.378	.222	.440		.376	.244
Major in business	-.355		.464	.446	-.352		.466	.452	-.360		.463	.438	-.496		.458	.281	-.381		.467	.416	-.392		.466	.402	-.317		.462	.494
Elite education	.031		.503	.950	.041		.508	.936	.023		.502	.963	.112		.493	.822	.038		.504	.940	-.014		.505	.978	.024		.500	.962
Tenure	.042		.027	.117	.042		.027	.118	.044		.027	.103	.041		.026	.118	.044		.027	.106	.044		.027	.102	.045	*	.027	.090
Functional background	.910	**	.449	.045	.914	**	.451	.046	.993	**	.455	.031	1.024	**	.442	.022	.955	**	.455	.038	.965	**	.452	.035	.837	*	.449	.065
Moderators																												
Variable pay	-.006		.007	.403	-.006		.007	.397	-.008		.007	.259	.004		.008	.582	-.011		.010	.284	-.004		.007	.554	.001		.008	.883
Shareholdings	.162		.763	.832	.159		.767	.836	.151		.762	.844	.176		.747	.814	.115		.768	.881	.208		.765	.786	.209		.759	.784
Interactions																												
Age X Variable pay					.028		.175	.871																				
Educational level X Variable pay									.172		.156	.274																
Major in school X Variable pay													-.883	**	.376	.021												
Elite education X Variable pay																	.247		.358	.492								
Tenure x Variable pay																					-.154		.158	.334				
Output Functional Background x Variable pay																									-.585		.386	.133
Age X Shareholdings																												
Educational level X Shareholdings																												
Major in school X Shareholdings																												
Elite education X Shareholdings																												
Tenure x Shareholdings																												
Output Functional Background x Shareholdings																												
Constant	3.480		2.344	0.141																								
F statistics (sig)	4.430 ***				4.417***				4.260***				4.674***				4.190***				4.234***				4.364***			
R square	0.420				0.420				0.427				0.450				0.423				0.425				0.433			
Adjusted R square	0.325				0.319				0.327				0.353				0.322				0.325				0.334			
R square change					0.000				0.007				0.030				0.003				0.005				0.013			
VIF Range	1.202-1.890				1.204-1.891				1.202-1.892				1.223-1.902				1.256-2.549				1.177-1.890				1.254-1.902			
Note: N=122																												
* p < 0.10, ** p < 0.05, *** p < 0.01																												

Dependent Variable	Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i				Alliance Strategy 2i			
	Model 10				Model 11				Model 12				Model 13				Model 14				Model 15			
Control Variables	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.013		.013	.331	.010		.013	.433	.012		.013	.374	.012		.013	.371	.010		.014	.441	.012		.013	.352
Firm size	.000		.000	.283	.000		.000	.349	.000		.000	.328	.000		.000	.277	.000		.000	.379	.000		.000	.294
International sales	.012		.008	.117	.012		.007	.115	.011		.007	.135	.012		.007	.107	.011		.007	.136	.012		.008	.121
RD orientation	.319		.257	.217	.346		.252	.172	.331		.254	.195	.347		.252	.172	.357		.255	.165	.356		.254	.165
Alliance Function	1.504	***	.478	.002	1.436	***	.469	.003	1.502	***	.476	.002	1.436	***	.471	.003	1.440		.474	.003	1.450	***	.472	.003
Alliance Number	-.025		.020	.220	-.025		.020	.215	-.025		.020	.218	-.024		.020	.229	-.026		.020	.204	-.024		.020	.226
Past performance	.162	***	.058	.007	.158	***	.058	.008	.156	***	.059	.010	.155	***	.059	.009	.163		.058	.006	.166	***	.059	.006
Industry effect 1	1.585	***	.494	.002	1.526	***	.487	.002	1.554	***	.490	.002	1.538	***	.488	.002	1.520		.493	.003	1.561	***	.490	.002
Country effect	.625		.770	.419	.857		.767	.267	.697		.762	.362	.663		.759	.385	.740		.769	.338	.645		.764	.400
Independent variables																								
Age	-.073	**	.034	.036	-.063	*	.033	.061	-.068	**	.033	.043	-.063	*	.033	.063	-.066		.033	.050	-.066	*	.033	.051
Level of education	.451		.380	.238	.442		.377	.243	.473		.379	.215	.511		.379	.181	.514		.389	.190	.450		.380	.238
Major in business	-.365		.466	.435	-.370		.462	.426	-.302		.473	.524	-.376		.464	.419	-.347		.466	.457	-.360		.465	.441
Elite education	.036		.505	.944	.049		.501	.922	.037		.504	.942	-.077		.512	.881	.036		.505	.943	.025		.504	.961
Tenure	.045		.027	.103	.033		.027	.224	.044		.027	.106	.038		.027	.158	.041		.027	.128	.042		.027	.118
Functional background	.895	**	.451	.050	.959	**	.449	.035	.934	**	.452	.041	.959	**	.450	.036	.902		.451	.048	.967	**	.458	.037
Moderators																								
Variable pay	-.006		.007	.420	-.006		.007	.353	-.006		.007	.421	-.006		.007	.400	-.006		.007	.364	-.006		.007	.357
Shareholdings	.191		.767	.804	.130		.761	.864	-.136		.900	.881	.841		.977	.392	.013		.818	.988	-.211		.944	.824
Interactions																								
Age X Variable pay																								
Educational level X Variable pay																								
Major in school X Variable pay																								
Elite education X Variable pay																								
Tenure x Variable pay																								
Output Functional background x Variable pay																								
Age X Shareholdings	-.108		.196	.580																				
Educational level X Shareholdings					-.233		.176	.187																
Major in school X Shareholdings									.264		.420	.531												
Elite education X Shareholdings													-.439		.395	.270								
Tenure x Shareholdings																	.104		.199	.604				
Output Functional background x Shareholdings																					.276		.409	.502
Constant	3.876		2.458	.118	3.318		2.339	.159	3.633		2.364	.127	3.082		2.369	.196	3.184		2.420	.191	3.397		2.354	.152
F statistics (sig)	4.173***				4.313***				4.182***				4.262***				4.170***				4.188***			
R square	0.422				0.430				0.422				0.427				0.422				0.423			
Adjusted R square	0.321				0.330				0.321				0.327				0.320				0.322			
R square change	0.002				0.010				0.002				0.007				0.002				0.003			
VIF Range	1.204-1.905				1.161-1.890				1.217-1.891				1.204-2.177				1.203-1.901				1.203-2.016			
Note: N=122																								
* p < 0.10, ** p < 0.05, *** p < 0.01																								

Table 2- 16: Regression results for Alliance strategy with 2-item scale (N= 68)

Dependent Variable	Alliance Strategy 2i			Alliance Strategy 2i		
	Model 1			Model 2		
Control Varaibles	B	SE	Sig	B	SE	Sig
Firm age	.009	.021	.668	-.008	.023	.716
Firm size	.000	.001	.804	.000	.001	.739
International sales	-.003	.017	.849	.003	.018	.858
RD orientation	.286	.370	.443	.211	.376	.578
Alliance Function	.173	.504	.733	-.071	.514	.890
Alliance Number	-.001	.010	.885	-.005	.011	.643
Past Performance	-.112	.079	.163	-.099	.080	.223
Industry effect 1	-.231	.762	.762	.736	.854	.393
Country effect	-.246	1.179	.836	.083	1.191	.945
Independent Varaibles						
Age				.058	.044	.191
Educational Level				.268	.471	.572
Major in School				-.768	.434	.083
Elite education				.054	.546	.921
Tenure				-.001	.032	.964
Functional Background				-.315	.485	.519
Constant	9.449	2.332	0.000	6.334	3.642	0.088
F Statistics (sig)	0.266			0.685		
R2 square	0.040			0.160		
Adjusted R square	-0.109			-0.083		
R square change				0.120		
VIF Range	1.106-1.966			1.160-2.416		
Note: N = 68						
* p < 0.10, ** p < 0.05, *** p < 0.01						

Table 2- 17: A summarised comparison table for different robustness tests with original regression results

	Manufacture Dummy (Industry Effect 1)		Split samples (Industry Effect 2 -PCB vs PLAS)				Alliance Strategy with 2 items		
Samples size	190		122 (PCB)		68 (PLAS)		190	122 (PCB)	68 (PLAS)
Industry effect	1 Dummy (Initial Result)	3 dummies	1 Dummy	3 dummies	1 Dummy	3 dummies	1 Dummy		
Past Performance									
Eiganvalue	3.04		3.098		2.921		3.04	3.098	2.921
AVE	75.997		77.448		73.013		75.997	77.448	73.013
Cronbach Alpha	0.894		0.901		0.876		0.894	0.991	0.876
Alliance strategy									
Eiganvalue	2.272		2.296		2.331		1.637	1.868	1.571
AVE	75.746		76.544		77.693		81.857	84.285	78.55
Cronbach Alpha	0.839		0.843		0.853		0.776	0.814	0.693
F statistics (sig)	P < 0.01	P < 0.01	P < 0.01	P < 0.01			P < 0.01	P < 0.01	
Adjusted R sqaure (range)	0.216 ~ 0.231	0.209 ~ 0.225	0.292 ~ 0.319	0.292 ~ 0.320	-0.115 ~ 0.010	-0.133 0.015	0.229-0.244	0.306 ~ 0.353	-0.127 ~ 0.000
Hypotheses									
H1_Age			p < 0.05	p < 0.05				p < 0.05	
H2a_education Level									
H2b_Major in Business									
H2c_Elite Education									
H3_Tenure	p < 0.05	p < 0.1	p < 0.1	p < 0.1			p < 0.1	p < 0.1	
H4_Functional Background								p <0.05	
H5_Variable pay									
Variable pay X Major in business	p < 0.1	p < 0.1	p < 0.05	p < 0.05			p < 0.05	p < 0.05	
Variable pay X Output function Bgd	p < 0.1	p < 0.1		p < 0.1			p < 0.1		
H6_Equity Ownership	p < 0.1								
Significant Controls									
Firm size	p < 0.05	p < 0.1			None	None	p < 0.05	p < 0.1	None
International Sales							p < 0.1	p < 0.1	
Alliance Function	p < 0.01	p < 0.01	p < 0.01	p < 0.01			P < 0.05	P < 0.05	
Past Performance	p < 0.01	p < 0.01	p < 0.01	p < 0.01			P < 0.01	P < 0.01	
Mananufacturing (Industry effect 1)	p < 0.05		P < 0.05				P < 0.01	P < 0.05	
Equipment & Machinery		p < 0.05							
RawMaterials		p < 0.05		p < 0.05					
Others		p < 0.05		p < 0.1					
PCB vs Platic (Industry effect 2)	p < 0.01	p < 0.01							

2.5. Discussion

Strategic alliances play a vital role in today's collaborative business relationships, and for this reason scholars have expended considerable efforts in trying to formulate theories to understand the outcome of strategic alliances (Eisenhardt and Schoonhoven, 1996, Parise and Casher, 2003, Hoffmann, 2005, Hoffmann, 2007). In this study, I began by highlighting the importance of top executives in determining the nature of alliance strategy. I grounded my work in the theoretical underpinnings of upper echelons theory (Hambrick and Mason, 1984) and agency theory (Jensen and Meckling, 1976) to uncover managerial orientations in relation to alliance strategy.

Previous studies on alliance strategy do not take into account the influence of top executives on the choice of alliance strategy (Eisenhardt and Schoonhoven, 1996). Although scholars have shown the effect of managerial characteristics on strategic choice and strategic decision-making (e.g. Brouthers et al., 2000, Hitt and Tyler, 1991), we know little about how managerial characteristics may influence the choice of alliance strategy. Also, how the relationship between managerial characteristics and choice of alliance strategy may be influenced when we take executive compensation package into account. From the literature, we know that compensation package can mitigate managerial self-interest and may reduce agency costs (Jensen and Meckling, 1976, Jensen and Murphy, 1990). However, the effect of compensation package on

alliance strategy was not well documented. Hence, I attempted to extend alliance research in the areas of strategic orientations, upper echelons and alliance strategy by examining the influence of managerial characteristics on the choice of alliance strategy. I explored the moderating effects of financial alignment mechanisms on managerial behaviours in relation to alliance strategy. I found some empirical support in both direct and indirect relations relating to the orientation of alliance strategy toward portfolio or standalone strategies.

I hypothesised that managerial characteristics – namely, age, education level, major in business, elite education, tenure and functional background – would influence the choice of alliance strategy. Based on my sample, I found that tenure (H3) was a significant influence on the choice of alliance strategy.

Furthermore, I hypothesised that financial alignment mechanisms such as variable pay and equity ownership in the firm would moderate the relationship between managerial characteristics and alliance strategy. I found that compensation package of variable pay (H5) had significant moderating effects when executives majored in business-related subjects as well as when executives were from output functional backgrounds. My findings suggest that variable pay may be an important element in the relationship between top managers' characteristics and the choice of alliance strategy. The moderating influences of variable pay had a significant impact

on the relationship between major in business and alliance strategy. It also has a significant effect between output functional background and alliance strategy. I found that executives with a business major were more than likely to have the tendency to choose a standalone strategy when they received a high variable pay than executives who majored in other subjects. As my result has shown, an increase in variable pay appears to negatively impact the association between alliance strategy and major in business.

Moreover, I found that executives with output functional backgrounds were more likely to choose a standalone strategy when they received a high variable pay. Indeed, the result showed that an increase in variable pay negatively influenced the relationship between output functional background and alliance strategy.

In my robustness tests, when I split the samples by industries – printed circuit board (PCB) and Plastic rubber (PLAS), with industry effect 1 as three dummy variables, I found executives with output functional background in PCB industry were more likely to choose a standalone strategy when they received a high variable pay, but not for PLAS industry. When industry effect 1 is used as a control variable for the two samples, I found no significant results for PLAS industry, probably because of small sample size.

Also, when I tested alliance strategy with a two-item scale, without splitting the

sample, I found executives with output functional background were more likely to choose a standalone strategy when they received a high variable pay. This is the same as the original result.

The study failed to find support for some of the hypotheses. First, age was not a significant predictor of choosing alliance strategy contrary to the hypothesis (H1). Two possible explanations for the differences from my hypothesis related to age (H1) are: (1) age is related to risk-taking propensity (Bantel and Jackson, 1989, Hambrick and Mason, 1984, Wiersema and Bantel, 1992) and managers in my samples do not perceive standalone as a riskier strategy than portfolio strategy, and (2) as strategic change of alliances operations in the PCB and plastic rubber industries are common, younger and older managers are relatively adaptable to the industrial environment. Alliances may be orchestrated due to market demand or technological changes. Experience and professional background are likely to facilitate alliance formation and may be more relevant to the choice of alliance strategy than age. These two reasons may explain why age does not have a significant influence on the choice of alliance strategy.

However, in my robustness tests, when I split the samples by industries – printed circuit board (PCB) and Plastic rubber industries (PLAS), I found age became significant for the PCB industry ($p < 0.020$). Also, the robustness test for alliance

strategy with two-item scale, I found that age is significant for PCB industry ($p < 0.032$). This seems to suggest that managerial characteristics of age for executives in the PCB industry is more related to firm alliance strategy. For the PLAS industry, I found no significant results for both robustness tests due to the small sample size.

Second, educational background was not found to be significant in predicting the choice of alliance strategy contrary to hypotheses H2a, H2b and H2c. The possible explanations why educational backgrounds do not appear as the key determinants of alliance strategy are as follows: strategic alliances formed in the two sample industries are often related to product development and market channels which tend to be more related to managerial experiences and professional network. Hence, (1) The level of education is not sufficient for developing industrial specific knowledge required for formulating alliance strategy, (2) Executives may have completed their formal education many years ago so educational background does not play an important role in certain strategic decision-making scenarios (Shenkar and Zeira, 1992, Finkelstein and Hambrick, 1996), and (3) The network from elite education may be obsolete, and classmates are in different fields rather than in my sample industries. The social capital gained from elite education does not really provide suitable external resources to facilitate alliance formation. Hence, educational background does not influence alliance strategy in the sample industries.

Although scholars have suggested that functional backgrounds influence strategic orientation (Brouthers et al., 2000, Bantel and Jackson, 1989, Geletkanycz and Black, 2001, Bermiss and Murmann, 2014), in my study, functional backgrounds (H4) did not have an impact on alliance strategy. I suspect that this can be a methodological issue as we only categorised executives into output functional background (Hambrick and Mason, 1984) and non-output functional background. If we are able to categorise executives into more detailed functional backgrounds, we might be able to see the impact on alliance strategy.

However, in my robustness tests, when using alliance strategy with two-item scale, output functional background for PCB industry became significant at ($p < 0.035$). This seems to suggest that output functional background is more related to alliance strategy when executives do not consider the time horizon of the alliances.

For the moderating influence of equity ownership in the firms, my empirical result did not show the moderating effect of equity ownership in the firm on the relationship between managerial characteristics and alliance strategy. A possible explanation is that more than 60% of the sample executives have less than 25% of shareholdings in their firms. A small percentage of shareholdings does not affect their personal wealth or influence their risk propensity. Therefore, it does not moderate the relationship between managerial characteristics and alliance strategy.

In sum, the empirical results provide some initial support for expanding alliance strategy research using key elements related to top executives such as managerial background and compensation package to understand the choice of alliance strategy. This study makes a start at distinguishing managerial orientation for alliance strategy. The empirical results not only support the proposed theory that top managers' characteristics impact on the orientation of alliance strategy toward standalone or portfolio strategy, but also provide evidence that compensation package is related to the relationship between top managers' characteristics and their orientation toward alliance strategy. In light of alliance research, my result suggests that much more work needs to be done in examining top managers' characteristics and compensation package in relation to their choice of alliance strategy. This study has conceptualised and validated variable pay in the context of choosing alliance strategy. However, compensation package consists of other elements such as stock options, employee perks and retirement funds. It can be fruitful for future alliance researchers to explore the impact of other elements in the compensation package on the relationship between managerial characteristics and choice of alliance strategy. Furthermore, the likelihood of industrial differences in relation to alliance strategy requires further investigations so that we can make generalisations confidently as the sample only consists of the PCB and plastic rubber industries.

Limitations

Although the study provides valuable insights about alliance strategy orientation and the influence of financial incentives on such orientation, it suffers from a number of limitations. First, I collected the data on the tendency of choosing alliance strategy after the choice was made. The responses may be an adjusted perception (Brouthers et al., 2003, Brouthers et al., 2000). Future research may consider a longitudinal study, and, using improved measures, could clarify how alliance strategic orientation was formed and also the process to formulate its alliance strategy.

A second limitation is that only perceptual measures of alliance strategy and past performance were used as control variables. Perceptual measures may be biased and reflect a desired state rather than an actual scenario (Brouthers et al., 2003). Future research efforts may consider to evaluate secondary data on the collections of firm alliances to validate firm alliance strategy. For past performance measure, financial data from secondary sources can be used for triangulation.

Third, response bias may be present. My observation is that Chinese executives or Chinese in general tend to avoid extreme response options, or exaggerate in their answers. Krosnick (1999) suggests that avoiding extreme answers in surveys may represent a response bias. Future research may consider to design the questionnaire differently to overcome this issue.

Fourth, future research may consider extending the range and measure of the managerial characteristics. This may help to identify other personal factors that have an influence on the tendency of alliance strategy. Additional factors may include socio-economic background such as income, cultural/ethnicity and religion, because these factors may influence one's attitudes, beliefs and behaviours.

Fifth, this study did not consider the outcome of alliance strategy. Future studies may wish to extend my study to include the evaluation of alliance strategy choice in light of firms' performance or realised value creation.

Sixth, I control for country effect in my study, as firms in my sample consist of Taiwanese and Chinese firms. It is likely that these firms are similar in culture as they speak the same language, but their business practices and norms can be quite different. In my study, this control was statistically insignificant. Future studies may consider using a more detailed measure to test institutional differences such as used in Brouthers (2013a).

Seventh, I was not sure if the two industries in my sample have similar strategies (business level or corporate level), and I do not know if firms' competitive strategies may have an impact on the choice of alliance strategy. I failed to include other strategic and environmental factors that may have influenced the choice of alliance strategy. Future studies may take into consideration more strategies factors within the model.

This may help to achieve a better model specification and potentially find stronger TMT effects.

Eighth, the sample consists of firms from Taiwan and China in both the printed circuit board and the plastic rubber industries. These are quite specific industries. Therefore, the result of my studies may not be generalisable to other industries.

Ninth, I did not look at how innovative the firms in my sample were. It would be valuable to compare firms with high innovation to firms with low innovation in the two industries, to see if innovativeness influences how firms choose their alliance strategy. Future studies may consider capture innovativeness of firms in the research design.

Management implications

This study confirms that executives do adopt different alliance strategies. To some extent, their managerial background characteristics are related to their choice of alliance strategy. Thus, this study provides insights on how to match the right managers to the job and provide suitable packages to retain these managerial talents for long-term growth.

First, tenure is an important characteristic in choosing alliance strategy. Executives with longer tenure in their positions tend to adopt a portfolio strategy. Executives with shorter tenure in their positions tend to adopt a standalone strategy.

This largely relates to executives' industrial experiences and the specific job-related skills they have. This is an important finding for firms' alliance operations. When firms frequently form alliances with other firms, they need executives suitable for the job in order to achieve better firm performance. Firms that have a portfolio of alliances can consider executives with longer tenure for their alliance operations because these executives tend to have the capabilities to initiate, coordinate and manage firms' different alliances together. This can lead to better firm performance, as firms can benefit from these executives' abilities to assess strategic risks of different alliances as well as their deeper industrial knowledge to establish a firm's alliance portfolio.

Second, executives with an educational background majoring in business-related subjects tend to choose a standalone strategy when they receive a high percentage of variable pay in their total salary package, e.g. high bonus. These executives tend to choose portfolio strategies when variable pay is only a low percentage in their total salary package. This suggests that for firms with more result-oriented alliances, a standalone strategy may be preferred. High bonus is an important incentive to maintain a standalone strategy orientation for executives with a major in business-related subjects. However, firms that operate projects with a long-term projection for their alliance operations need executives adopting a portfolio strategy. High bonus ratio to its total salary may not be an effective incentive to maintain the

portfolio strategic orientation for executives with a major in a business-related subject. Therefore, for executives with a major in business-related subjects, changes in bonus ratio may lead to a change in their strategic orientation. Firms need to understand the effect of this type of compensation package in order to maintain firms' preferred alliance strategies.

Third, executives with output functional background such as sales and marketing tend to choose a standalone strategy when they receive high variable pay, and they tend to choose a portfolio strategy when they receive a low variable pay. As variable pay is a portion of compensation package and appears to play an influencing role on the choice of alliance strategy for executives with sales and marketing backgrounds, firms can design and use this type of compensation package, i.e. the bonus pay, to maintain or encourage preferred alliance strategy for executives with sales and marketing backgrounds.

The results of my research suggest that it is important for firms to understand executives' backgrounds and how they influence alliance strategy choices.

Conclusion

My study makes several important contributions. Prior to this research there was little understanding of managerial characteristics on alliance strategy. Previously, scholars have shown that managerial characteristics are important in determining firm strategy. For example, Brouthers et al. (2000) found empirical support that managerial characteristics (e.g. age, experience, education and risk propensity) were all important predictors of strategic aggressiveness. Hitt and Tyler (1991) found that managers' age, educational level, work experience and managerial level influence their strategic decision formulation. However, no studies considered the strategic orientation of top managers on their alliance strategy. By exploring the factors leading to the choice of alliance strategy, I add insights about how managerial characteristics can impact the choice of alliance strategy. This is important because CEOs' decisions on alliance strategy are likely to impact the outcome of organisations (Hambrick et al., 2005).

Moreover, I clarify the notion of alliance strategy as two distinctive strategies that are standalone and portfolio strategies. Previous studies tend to suggest that firms should operate their alliance operations with a holistic view (Parise and Casher, 2003) and suggest that portfolio alliance strategy may be more beneficial (Ozcan and Eisenhardt, 2009, Hoffmann, 2007), but the distinction of the two alliance strategies are blurry and rather descriptive. In this study, I clarified the distinctions between

standalone and portfolio strategies; I made the two strategies more explicit and created measures for alliance strategy which gauge the choice of alliance strategy orientation. This enables us to better appreciate the different approaches to alliance strategy and explore the factors that may influence the choice of alliance strategy. My study shows that firms adopt different alliance strategies contingent on managerial backgrounds as well as compensation packages. This adds to the current alliance research as well as creates more discussion on top managers' strategic perspective.

Finally, my study highlights the importance of managerial compensation package for strategic decision-making in terms of alliance strategy. Thus, I advance firm strategic orientation research and provide some valuable insight on human resources consideration.

Overall, my study implies the need to rethink conventional approaches to managing strategic alliances. Alliances are no longer isolated incidents and have become an inevitable part of business. Thus, ad hoc strategy no longer suffices to manage a firm's alliance operation. Rather, top managers need to take a holistic view in order to reconfigure and integrate a firm's resources with resources of alliance partners so that it enables them to generate optimal value in a firm's alliance operation. Moreover, to capitalise on the joint effect of firm alliances, top managers need to evaluate the interdependence of all alliances, and assess overall risks and uncertainties

for firm alliances. In addition, companies need to evaluate if they are providing suitable compensation packages to these top managers and be able to retain these talents. In conclusion, the findings in this study can serve as a useful basis for making decisions about firm alliance operation as well as assisting in recruiting suitable top managers.

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III. DO ALLIANCE STRATEGY AND ALLIANCE DIVERSITY CONTRIBUTE TO FIRM PERFORMANCE?

3.1. Introduction

Firms are increasingly engaged in multiple alliances with different partners, because businesses can no longer compete effectively without inter-firm collaborations in today's business environment (Hoffmann, 2005, Hoffmann, 2007, Ireland et al., 2002, Lavie, 2007, Ozcan and Eisenhardt, 2009, Parise and Casher, 2003). Firms require a comprehensive alliance strategy that enables them to locate necessary external resources and capabilities, using several coordinated alliances (Gomes-Casseres, 1996). Through re-combination of heterogeneous resources from coordinated alliances, a firm is able to develop a collection of unique and value-creating resources which cannot be created independently (Ireland et al., 2002). As a consequence, many firms are engaged in multiple alliances simultaneously. This phenomenon has led to a series of research in the areas of emergence, configuration, and management of firm alliances (Wassmer, 2010).

One important stream of the research relating to the configuration of firm alliances is alliance diversity (Baum et al., 2000, De Leeuw et al., 2014, Duysters and Lokshin, 2011, Duysters et al., 2012, Goerzen and Beamish, 2005, Hoehn-Weiss and Karim, 2014, Hoffmann, 2007, Jiang et al., 2010, Koka and Prescott, 2008, Lee, 2007,

Swaminathan and Moorman, 2009, Terjesen et al., 2011, van Beers and Zand, 2014, Wuyts and Dutta, 2014). Alliance diversity has been defined as 'the degree of variance in partners, functional purposes and governance structures of the alliances' (Jiang et al., 2010 p: 1137). The notion of diversity indicates a firm's potential to access heterogeneous resources which can be recombined with the firm's internal resources to develop competitive advantage (Barney, 1991).

Studies have demonstrated that alliance diversity is positively related to a firm's financial and innovation performance (Baum et al., 2000, Mouri et al., 2012, Phelps, 2010, Sampson, 2007, van Beers and Zand, 2014). Alliance diversity also appears to be an important element for firm strategy and performance; it can facilitate diversification, and diverse external partners can be a vehicle to access external resources that are not otherwise available (Das and Teng, 2000, Lavie, 2006).

However, high levels of diversity in a firm's collection of alliances can also backfire and have negative consequences on firm performance (Faems et al., 2010, Goerzen and Beamish, 2005, Koka and Prescott, 2008, Vasudeva and Anand, 2011). Indeed, increased diversity magnifies managerial challenges in relation to resource coordination among alliance partners. For example, a high level of diversity creates additional transaction and coordination costs due to difficulties in goal-alignment for different alliances (Duysters and Lokshin, 2011, Goerzen and Beamish, 2005, Hoang

and Rothaermel, 2005, Hoffmann, 2005). Nonetheless, alliance diversity has the advantage of providing opportunities to access diverse information and resources, as well as to leverage different capabilities from various alliances (Beckman and Haunschild, 2002, Lavie and Rosenkopf, 2006, Rothaermel and Deeds, 2004).

Alliance diversity has been studied in different ways. For example, Jiang et al. (2010) investigate partner diversity (measured by industry, nationality and organizational types), functional diversity and governance diversity. Koka and Prescott (2002) discuss information diversity within firms' repeat ties or multiple current ties. Goerzen and Beamish (2005) evaluate alliance network diversity, geographical diversity and product diversity in the context of international joint ventures of multinational companies. Duysters and Lokshin (2011) show partner diversity of innovator and imitator, in terms of industry and foreign and domestic partners. Alliance diversity has also been discussed in relation to functional diversity and governance diversity (Jiang et al., 2010).

Different types of alliance diversity appear to have varying effects on performance. Studies show that partner diversity has a U-shaped relationship with performance (Jiang et al., 2010), and information diversity is significantly related to firm performance (Koka and Prescott, 2002). Alliance network diversity is negatively related to economic performance, geographical diversity has a positive and

significant associated with economic performance, and product diversity has an insignificant effect on performance (Goerzen and Beamish, 2005). Alliance diversity (i.e. alliance complexity) has an inverted U-shape relationship to innovative performance (Duysters and Lokshin, 2011). Functional diversity is positively related to firm performance (Hoehn-Weiss and Karim, 2014, Jiang et al., 2010). Governance diversity seems to be negatively related to firm performance (Goerzen, 2007, Jiang et al., 2010).

The variation in performance outcomes has led scholars to investigate the possible causes of the different outcomes in the diversity and performance relationship. One recent study asserted that alliance diversity and performance relationship may be contingent on firms' alliance experience and capabilities (Duysters et al., 2012).

In this paper, I seek to contribute to the debate on why diversity and performance may have varying relationships. I explore whether the mixed results of previous studies on alliance diversity and performance may be explained by a strategic consideration in forming alliances. Alliance diversity provides the opportunity to access a variety of resources and capabilities. A firm's strategy must reconfigure these resources and capabilities in order to adapt to the market, so that the firm can maintain its competitive position in a timely and efficient manner (He et al., 2013, Ozcan and

Eisenhardt, 2009).

Alliance can differ in nature depending on the manager's strategic considerations. For example, managers can form alliances in a standalone fashion or with a portfolio perspective. If a manager treats all of their alliances as standalone occurrences, synergistic effects derived from alliances are less likely to be fully realised, because each alliance may aim for a specific goal, and the firm is constrained on resources and capabilities from one alliance at a time. In comparison, when a manager takes a portfolio perspective in forming alliances, all alliances are evaluated based on the firm's overall corporate objective and then incorporated into the firm's alliance portfolio (Hoffmann, 2007). The overall combination of resources and capabilities available to the firm from multiple alliances will be channelled to suit multiple goals and fit into the firm's overall objective (Miles and Snow, 1984); therefore the synergistic effects may be greater. This implies that a manager's choice of alliance strategy is likely to influence the success of its alliance operation and impact its performance outcome. In other words, a firm's strategy for strategic alliance – either standalone or portfolio – can have a critical impact on alliance diversity and performance relationship.

I theorise that a firm's strategy – i.e. standalone or portfolio – will influence the relationship between alliance diversity and firm performance. The resource-based

view suggests that resource heterogeneity is the basic condition to achieve sustainable competitive advantage (Peteraf, 1993). Standalone strategy enables firms to access heterogeneous resources and capabilities from its alliance partners, but it may be less integrated, because managers with a standalone orientation do not view the overall effects of all alliances combined. The literature suggests that different types of diversity enable firms to access different resources and capabilities. If managers opt for a standalone strategy, they can still access different resources and capabilities, but they may create inefficient or redundant configurations (Vassolo et al., 2004), or more conflicts to overall strategy due to only considering one alliance at a time (Parise and Casher, 2003). This may result in multiple partners with the same or similar capabilities and resources, which may prevent firms from realising the possible synergistic effects of different alliances (Cui and O'Connor, 2012). In addition, these multiple partners are also likely to have competing interests. For example, when developing a product with alliance partners, the firm may not have a clear contract which specifies the proprietary rights and share of the profits associated with the output of the product development. This causes conflicts/competing interests, because each partner may aim for the highest share of proprietary rights and profits from the development. Strategic alliance often has such contract issues relating to proprietary rights and share of the profits associated with alliance output and profits (Baum et al.,

2000, Khanna et al., 1998, White and Lui, 2005, Williamson, 1991). Furthermore, firms that form alliances using the standalone strategy tend to fulfil the specific objectives of those alliances, but the effects may be temporary and encourage short-term gain (e.g. increasing revenue). Therefore, I theorise that when managers form alliances in a standalone fashion, the relationship between alliance diversity and performance will be negative.

In contrast, when managers take a portfolio approach, the access to different resources and capabilities from partners is managed holistically, taking into account the impact of integrating partners' and firms' resources more carefully. Evidence from research suggests that it is not a single resource that matters; rather, the synergistic combination and bundles of resources created by firms are more important (Grant, 1996, Hoffmann, 2007, Teece, 2007, Vassolo et al., 2004). The portfolio strategy enables firms to consider their overall diversification direction and risk levels so that they can better match external opportunities and internal resources (Hoffmann, 2005, Hoffmann, 2007, Parise and Casher, 2003). As a result, it facilitates the long-term prospects of the firm (Ozcan and Eisenhardt, 2009). In theory, alliance portfolio strategy enables firms to strategically evaluate their diverse partners' resources and capabilities, incorporate these into their own resources/stocks, and achieve a better sustainable competitive advantage than the standalone strategy (Hoffmann, 2005,

Hoffmann, 2007, Sarkar et al., 2009). Therefore, I theorise that when managers form alliances using a portfolio strategy, the relationship between alliance diversity and performance will be positive.

In this study, I contribute to the alliance diversity literature by developing and testing theories to explain how alliance strategy can impact the relationship between different alliance diversities and firm performance. The contribution of the paper is twofold. First, my study shows that the choice of strategic orientation in alliance formation (standalone versus portfolio) influences the relationship between alliance diversity and firm performance. Prior studies have demonstrated that the influence of alliance diversity on performance has so far been conflicting (Duysters et al., 2012, Lee et al., 2014). My study advances our understanding of how alliance strategies – i.e. either standalone or portfolio – influence the relationship between different types of alliance diversity and firm performance. In contrast to previous studies, the main interest of this study is not the relationship between various types of alliance diversity and performance. Rather, it focuses on how firms' alliance strategies and alliance diversity jointly affect firm performance, because a firm's strategy is likely to have a deterministic effect on its performance. The effects of two different alliance strategies – standalone and portfolio – are likely to provide a better explanation of the alliance diversity and performance relationship. In addition, a firm's choice of alliance strategy

is likely to have associated managerial implications. It is important for managers to understand that diversity may or may not lead to superior performance depending on the choice of alliance strategy. Taking a standalone approach may reduce the efficiency of having diversity within the alliances, as resource integration and reconfiguration are not easily achievable when each alliance is dealt with independently from other alliances. In comparison, a portfolio strategy may enhance the positive effect diversity can have on performance because this strategy encourages a holistic mind-set. Thus, resources and capabilities are shared and re-combined to effectively accumulate idiosyncratic resources which enhance a firm's competitive advantage.

Second, my study contributes to alliance literature by demonstrating that firms choosing a portfolio strategy result in high firm performance when they have a high level of partner diversity. However, firms choosing a standalone strategy suffer from low firm performance when they have a high level of partner diversity because a standalone strategy reduces the ability to recombine partners' resources and capabilities. In contrast, firms with higher partner diversity tend to benefit from a portfolio strategy because a portfolio strategy enables firms to better integrate firms' resources with external resources from partners.

In the following section, I discuss the literature and hypotheses underlying my analysis, and illustrate the theoretical model of alliance diversity and the impact of

firms' alliance strategy on firm performance. I then discuss the research design, followed by the empirical results. The final section concludes the paper by discussing the managerial and theoretical implications of this research.

3.2. Theory and Hypotheses

Formulating an effective alliance strategy can be vital for exploiting resources and exploring new opportunities for achieving superior firm performance (Brouthers et al., 2009, Brouthers et al., 2014, Cui and O'Connor, 2012, Hoffmann, 2007, Jiang et al., 2010, Lavie, 2006, Lavie and Miller, 2008). Companies have used strategic alliances for foreign market entry and for overcoming resource deficiency at the entrepreneurial founding stage (Brouthers et al., 2014, Nakos et al., 2014, Rothaermel, 2001b, Shan et al., 1994). Often, firms are engaged in more than one alliance in order to meet competitive challenges in the market environment (Hoffmann, 2007, Ireland et al., 2002, Parise and Casher, 2003). Engaging in multiple alliances allows firms to access a greater knowledge base for learning (Anand and Khanna, 2000) and complementary resources from different partners (Ahuja, 2000a, Gulati, 2007, Hoffmann, 2007, Lavie, 2006).

A company's network of alliances can have varying degrees of diversity. Alliance diversity refers to the differences in relation to alliance characteristics when determining the level of diversity within multiple alliances (De Leeuw et al., 2014). Jiang et al. (2010) refer to alliance diversity as partner diversity, functional diversity and governance diversity because these address three fundamental questions relating to an alliance: (1) Who does the firm ally with? (2) What is the purpose of the alliance

the firm intends to achieve? (3) How is the alliance governed? Partner diversity is the diversity of partners with whom the firm allies. It is related to a partner's industry, nationality and organisational types such as public or private firms, and for profit and not-for-profit organisations (Jiang et al., 2011). Functional diversity is concerned with 'the range of activities for which the firm uses alliances' (Jiang et al., 2010 p:1139). It arises from different functional purposes of an alliance, such as marketing, Research and Development (R&D), manufacturing and distribution (Brouthers et al., 2014, Rothaermel and Deeds, 2004). Governance diversity refers to 'the variety of structure with which the firm manages alliances'. For example, alliances can be structured as non-equity or equity ownership (Jiang et al., 2010).

A large number of studies suggest that a diverse collection of alliances enhances firm growth, financial performance, innovation performance, and increases a firm's ability to survive (Baum et al., 2000, Mouri et al., 2012, Ozcan and Eisenhardt, 2009, Phelps, 2010, Powell et al., 1996). Other studies have discussed the potential disadvantages of alliance diversity due to managerial challenges linked to the complexity of managing multiple related alliances (Duysters et al., 2012, Faems et al., 2010, Vasudeva and Anand, 2011). The findings of alliance diversity relating to performance are still equivocal (Duysters et al., 2012, Lee et al., 2014).

The positive and negative relationships found between alliance diversity and

performance have been explained using different theoretical orientations such as the Resource-Based View (RBV), Transaction Cost Economics (TCE), learning and knowledge, and social network (Lee et al., 2014). The Resource-Based View suggests that alliance diversity can increase resource accessibility and synergies. A high level of diversity can result in positive performance effects because it allows accessibility of a wide range of resources that would lead to a positive performance and help a firm overcome its internal resource constraints (Ahuja, 2000b, Baum et al., 2000, Das and Teng, 2000, Dyer and Singh, 1998, Lavie, 2006, Zaheer and Bell, 2005).

Transaction Cost Economics perspective tends to show a negative effect on performance because a high level of alliance diversity tends to increase transaction costs (Coase, 1937, Williamson, 1991). For example, high management and monitoring costs may occur when firms have a highly diverse set of partners and there is a lack of trust and familiarity (Dyer and Chu, 2003). Also, increasing the scope of the business with a diverse set of partners can lead to conflict and coordination problems, hence lowering firm performance (Goerzen and Beamish, 2005).

Social network theory tends to view alliance diversity as a network of partnerships whereby the resources from diverse network partners are likely to have implications on firm performance. For example, diverse information and experience enables quality decision-making (Gulati et al., 2000, Ozcan and Eisenhardt, 2009,

Zaheer and Bell, 2005). A diverse set of alliances enables learning and expansion of knowledge, which are likely to contribute positively to performance (Kale and Singh, 2007). For example, complementary knowledge leads to better knowledge sharing, resulting in positive firm performance (Gulati, 1999a, Jiang et al., 2010, Lavie and Miller, 2008).

Taken together, previous studies appear to agree that alliance diversity is important, but its effect on firm performance is still debated, as summarised in Table 3-1 below.

Table 3- 1: Selected empirical studies of performance implications of alliance diversity

Studies	Significant Effect	Performance measure	Theoretical orientations
Baum et al. (2000)	+	Revenue growth, RD spending growth, non RD employee growth, RD employee growth, Patenting rate	Social Network Theory
Beckman and Haunschild (2002)	+	Acquisition premiums and performance	Knowledge and learning
Cui and O'Conner 2012	+/–	Firm Innovation	Resource-Based View
De Leeuw et al. (2014)	+	Innovation performance and productivity	Resource-Based View
Duysters et al. (2012)	+/–	Alliance portfolio performance	Knowledge and learning
Goerzen and Beamish (2005)	+	Returns on sales, ROA, ROC	Social Network Theory
Hoehn-weiss and Karim (2013)	+	Young firm outcomes (IPO, acquisition or other)	Signaling theory
Jiang et al. (2009)	+/–	Net profit margin	Resource-Based View
Koka and Prescott (2002)	+/–	Productivity	Social Network Theory
Lavie and Miller (2008)	+/–	ROA	Knowledge and learning
Lee et al. (2001)	+/–	Start-up performance	Resource-Based View and Network theory
Lee (2007)	+	Rate of market entry	Social Network Theory
Leeuw et al. (2014)	+/–	Productivity, radical and incremental innovation	Resource-based View
Miller et al. (1998)	–	Decision extensiveness and comprehensiveness	Upper Echelons Theory
Powell et al. (1996)	+	Rate of growth	Social Network Theory
Phelps (2010)	+	Exploratory innovation	Social Network Theory
Terjesen et al. (2011)	+/–	High Tech. Venture performance	Resource-Based View
Van Beers ad Zand (2014)	+/–	Innovation performance	Knowledge and learning

3.2.1. Role of Alliance Strategy in Determining the Effect of Diversity on Firm Performance

I argue that the conflicting findings of the alliance diversity and performance relationship may be explained by a firm's alliance strategy. Superior performance

depends on firm strategy and its resource reconfiguration (Miles and Snow, 1984). Alliance strategy can determine how businesses operate their alliances, and this can impact on performance results (Hoffmann, 2007, Parise and Casher, 2003). Alliance strategy refers to the approach that firms adopt to establish their alliances. They can be formed using a standalone approach, in which a firm considers alliances as standalone (one-off) occurrences. In other words, each alliance has its own objective, and firms are not concerned with synergies or conflicts with other alliances. Standalone alliances may have specific goals, such as market entry or new product development (Brouthers et al., 2014, Eisenhardt and Schoonhoven, 1996, Ireland et al., 2002). Alliances can also be formed using a portfolio approach. This approach encourages firms to take a holistic view of their alliances. Using a portfolio approach, managers will think about the strategic implications across the whole collection of alliances when making alliance decisions (Hoffmann, 2005, Hoffmann, 2007, Parise and Casher, 2003, Vassolo et al., 2004, Vapola et al., 2010).

A portfolio approach and standalone approach engender different managerial concerns and orientation towards alliance formation. When a firm forms multiple alliances, it is likely that there will be strategically important interdependencies among alliances (Hoffmann, 2005). Access to diverse resources from alliances does not guarantee that synergies will be realised, and the benefits of alliance diversity can only

be realised through effective sharing of information and resources (Cui and O'Connor, 2012). Such information and resource sharing requires coordination among alliances. Firms need to recognise that potential synergies can be created among its collection of alliances. In other words, alliance diversity is not always beneficial if the firm cannot recognise the potential synergies throughout an effective alliance strategy, to manage and coordinate the diverse set of alliances.

Focusing on individual alliances taking a standalone approach may prevent the firm from recognising such interdependencies and result in inefficiency (Ross Jr and Robertson, 2007). For example, alliances for innovation and product development may rely on the knowledge from alliance partners in new markets as well as manufacturing knowledge from production alliance partners. Adopting a standalone approach does not encourage coordination of market or industry information within the alliance network. The sharing of information and resources may be restrained because the firm may optimise the benefits from each alliance, but sub-optimise inter-alliance benefits which may become detrimental to the firm as a whole.

By taking a portfolio approach, the firm is able to coordinate alliances and realise such interdependent relationships, and effectively utilise the knowledge obtained from different alliances. This allows the firm to better manage its diverse set of alliances as well as avoiding conflicts among alliances (Doz and Hamel, 1998,

Gulati, 1998). When a portfolio approach is adopted, the sharing of information and resources can be implemented across alliances. Consequently, the firm is likely to benefit from alliance diversity because the diverse resources and knowledge from different partners may be shared, thereby generating new resource combinations that facilitate innovation and the development of new technologies or new products (Swaminathan and Moorman, 2009). Better coordination can also increase a firm's efficiency by sharing production facilities, i.e. economies of scale (Cui and O'Connor, 2012).

Scholars have noted that firms not only benefit directly from individual alliances but can also obtain indirect benefits by learning from those alliances and applying the acquired capabilities and skills to other alliances or projects (Khanna et al., 1998). The ability to consolidate different knowledge bases from different alliances requires firms to establish learning initiatives which define processes to enhance learning. When a firm adopts a standalone strategy, it lacks the ability to consolidate knowledge bases and convert them to useful capabilities and skills. In contrast, a portfolio strategy can gather and consolidate a variety of knowledge bases from different alliances and retain them for future use.

3.2.2. The Moderating Effect of Alliance Strategy: Partner Diversity–Firm Performance Relationship

Studies show that partner diversity may sometimes lead to better firm performance. For example, including large partners in a firm's alliance network can give the focal firm more resources and capabilities, which leads to better performance outcomes (Duysters et al., 2012, Hagedoorn and Schakenraad, 1994, Stuart, 2000). The diversity of nationality and geographical location often facilitates a firm's access to knowledge and institutional resources in new markets, which can also result in enhanced performance (Brouthers et al., 2009, Brouthers et al., 2014, Wassmer, 2010). Lavie and Miller (2008) argue that geographical diversity improves firm performance due to better adaptation in foreign markets. Similarly, having partners in different industries may reduce competitive tension and facilitate learning, thus improving performance (Kale and Singh, 2007).

Notwithstanding the above, partner diversity may also be detrimental to performance. For example, national culture and institutional differences may create tension between partners (Brouthers, 2013b). Trust-building among partners can take a long time, and engenders costs in monitoring, coordination and integration (Dyer and Chu, 2003, Gulati, 1995a, Jiang et al., 2010). Performance may be affected when diverse ideas from different partners cause problems in an absorptive capacity, because

managers cannot manage and choose from too many diverse ideas (Cohen and Levinthal, 1990). Leakage or knowledge spill-over to partners when a firm collaborates with its competitors in the market is also a major issue of concern, especially when competitors overlap in backgrounds, experience, knowledge and technological bases, allowing them to readily capitalise on the knowledge spillover (De Leeuw et al., 2014, Jiang et al., 2011)

In general, most scholars find that partner diversity gives access to partners' knowledge and experience about different markets and different industries. I argue that performance can be improved when there is an effective configuration of the diverse knowledge and resources. When a standalone strategy is adopted, the manager will focus on one alliance at a time. Resource allocation is based on a specific alliance and lacks the flexibility for resource sharing or reconfiguration (Baum et al., 2000). In this case, even though partner diversity gives access to partners' knowledge and experience, it may not lead to a better performance, because resources are not leveraged jointly to be complimentary or to develop synergy. For example, partners can come from different industries that are somewhat related or completely unrelated. When using a standalone approach, there is less consideration for choosing partners from industries that are more related. When partners' industry backgrounds are unrelated, they may not be able to complement each other, and unfamiliarity with each other's industries

can result in ineffective collaboration (Dyer and Chu, 2003, Gulati, 1995a). Therefore, I argue that a standalone strategy negatively moderates the relationship between partner diversity and performance. When a portfolio strategy is adopted, the focus is on the totality of all alliances. It enables managers to effectively allocate resources among different alliances (Ozcan and Eisenhardt, 2009, Parise and Casher, 2003). This may lead to a better sharing of partners' knowledge and experience. For example, in relation to market entry, a firm that adopts a portfolio approach can build on the experience of previous market entry experience with partners and recombine them with its internal processes to improve the firm's capabilities (Sarkar et al., 2009). Studies have shown that performance improves when there is flexibility to allocate and reconfigure resources within a firm's collection of alliances (Baum et al., 2000, Hoffmann, 2005, Hoffmann, 2007, Ozcan and Eisenhardt, 2009, Parise and Casher, 2003). When a company adopts a portfolio strategy, the diversity of partners will tend to be managed in a holistic manner. Therefore, I argue that a portfolio strategy will enhance the effect of partner diversity on performance.

> **Hypothesis 1 (H1)**: Alliance strategy will moderate the relationship between partner diversity and firm performance. A portfolio strategy will strengthen the relationship between partner diversity and performance, whereas a standalone strategy will weaken this relationship.

3.2.3. The Moderating Effect of Alliance Strategy: Functional Diversity–Firm Performance Relationship

Firms can form alliances with partners who are specialised in the same or different functions. Firms that focus on same-function alliances can be described as having low functional diversity. Same-function alliances are easier for resources and information sharing because partners will have overlapping prior knowledge, which enhances absorptive capacity (Cohen and Levinthal, 1990). Studies show that R&D-related alliances facilitate innovations and may contribute to firm performance (Ahuja, 2000a, Brouthers et al., 2014, Faems et al., 2010, Stuart, 2000). Similarly, marketing alliances give the focal firm greater access to new markets and can also improve performance (Brouthers et al., 2014, Hagedoorn, 1993, Merchant and Schendel, 2000). Furthermore, Amaldoss and Staelin (2010) find that the impact of partner shirking is less detrimental to firm performance in same-function alliances than in cross-function alliances. This is because a partner's input in same-function alliances is compensatory and the focal firm can continue to perform even when shirking occurs. In cross-function alliances, shirking can stop the focal firm from performing, as the focal firm may lack competencies in the particular function that the partner is supposed to bring to the alliance.

Firms that favour cross-function alliances where partners have different

competencies (e.g. R&D and marketing) can be described as having high functional diversity. Different functional resources such as R&D and marketing can complement each other (Song et al., 2005). For example, biotechnology firms tend to focus their efforts on R&D and market their innovative drugs by allying with pharmaceutical firms, as the latter have stronger marketing competencies (Oliver, 2001, Rothaermel and Deeds, 2006). In addition, van Beers and Zand (2014) show that functional diversity enables the firm to learn and accumulate competencies from different functional sources to create and produce new products and consequently improve firm performance.

High functional diversity also has the advantage of facilitating the exploitation of new business opportunities and new knowledge beyond the scope of current alliances (Amaldoss and Staelin, 2010, Dussauge et al., 2000). Scholars suggest that functional diversity is positively related to firm performance (Jiang et al., 2010) because it encourages firms to balance exploitative and explorative activities for long-term viability (Lavie and Rosenkopf, 2006).

However, when functional diversity is high, low absorptive capacity may limit knowledge transfer across alliances (Lane and Lubatkin, 1998). Firms with different functional backgrounds may be unfamiliar with each other's specialisation, and this can cause conflicts within the alliance, resulting in ineffective collaboration

(Amaldoss et al., 2000, Amaldoss and Staelin, 2010). For example, when one alliance is R&D based and another alliance is purely marketing based, the lack of common language and protocol may increase difficulty in communication and knowledge sharing between alliances.

I argue that the relationship between functional diversity and performance might be dependent on the alliance strategy chosen. When functional diversity is high, the problems associated with communication and with learning from partners from different functional backgrounds can be attenuated when there is sound coordination and adequate effort to create synergy between alliances. I theorise that a portfolio strategy can reduce the negative effect that high functional diversity can have on performance.

Firstly, when a company adopts a portfolio strategy, functional diversity will tend to be managed in a holistic manner, and competence gaps are likely to be filled through integrating different functional alliances. For example, if the focal firm possesses strong R&D capabilities, and partners with a firm that has strong marketing capabilities and another that has strong distribution capabilities, then it will be able to expand its value chain and contribute to firm growth. I argue that a manager who adopts a portfolio strategy would be more careful when planning resources, thereby

ensuring that there is an effective combination of functional competencies that can bring long-term growth to the company.

Secondly, high functional diversity can lead to task conflicts (Mohr and Puck, 2005, Parkhe, 1991). A portfolio alliance strategy encourages managers to look at the relationship between alliances. This means that managers may become more aware of conflicts that may occur between different functions. I argue that portfolio strategy can reduce cross-functional conflicts in alliances and therefore mitigate the negative impact of functional diversity on performance.

Thirdly, a portfolio strategy also leads managers to consider a longer-term perspective (Hoffmann, 2007, Ozcan and Eisenhardt, 2009, Parise and Casher, 2003). Scholars have shown that firms' prior experience in engaging a large number of alliances enables the firms to accumulate knowledge about partners and facilitate the learning between alliances (Anand and Khanna, 2000, Heimeriks et al., 2007, Rothaermel and Deeds, 2006, Schilke and Goerzen, 2010). Adopting a portfolio strategy will encourage a long-term view whereby the firm engages in long-term partnerships and learns from diverse and complementary functional alliances. This enables to fill competence gap in firm's certain functions. I argue that portfolio strategy can help managers to extract certain advantages from high functional diversity, and this is likely to offset the negative impact of functional diversity.

In contrast, I theorise that a standalone strategy can increase the negative effect that high functional diversity can have on performance. Firstly, when functional diversity is high, management practice can be very different among partners from different functional backgrounds, and task conflicts can also occur if the alliances are not effectively coordinated (Mohr and Puck, 2005, Parkhe, 1991). A standalone strategy tends to have a specific objective for a particular alliance, and in order to achieve the objective, managers may ignore all other alliances. Thus, managers using a standalone strategy may only resolve specific conflicts within the alliance, and neglect task conflicts and variations in management practices between cross-function alliances. This is likely to amplify the negative impact of high functional diversity.

Secondly, high functional diversity means that the firm is simultaneously engaged in alliances of different functions (e.g. R&D, marketing, production), which may rely on the same internal resources. Conflicts can occur when different functional alliances compete for internal resources. For example, an R&D alliance may require market information from marketing managers. At the same time, these marketing managers may have specific time commitments to their own marketing alliances. They may be unwilling to devote time for the R&D alliance. I argue that adopting a standalone strategy will exacerbate the conflict in internal resources competition, because this strategy encourages a short-term focus on a single alliance. With a short-

term focus on a single alliance, managers will only think about giving priority to their own alliances when competing for internal resources, as they aim for the shortest time frame for fulfilling alliance objectives. They will not consider the needs of any other alliances. Therefore, a standalone strategy is likely to increase the negative impact of high diversity on performance.

Thirdly, when a standalone strategy is adopted, the manager will focus on the competencies required for a specific alliance and is unlikely to consider whether these competencies can be reconfigured to use in other alliances or in the future. Consequently, a standalone approach may create inefficiencies in a firm's alliance knowledge and competencies management. The knowledge that can be gained from having high functional diversity is lost if there are no coordination efforts between alliances (Kale and Singh, 2007, Sarkar et al., 2009). Similarly, in the case of low functional diversity, although the absorptive capacity amongst same-function firms may be high (Amaldoss and Staelin, 2010), a standalone strategy does not encourage the synergistic deployment of competencies (Hoffmann, 2007, Kale and Singh, 2009). Overall, I argue that managers adopting a standalone strategy would have a short-term view and be less willing to build long-term and trusting relationships with partners from same-functional or cross-function alliances. Hence, a standalone strategy is

likely to increase the negative impact that high functional diversity can have on performance.

In summary, a portfolio strategy encourages complementarity and can therefore positively moderate the relationship between functional diversity and performance. Integrating different yet complementary competencies presents opportunities for synergy derived from economies of scope. A standalone strategy may be less concerned about the impact of similarity and complementarity of functional collaborations. Therefore, a standalone strategy is likely to negatively moderate the relationship between functional diversity and performance.

> **Hypothesis 2 (H2)**: Alliance strategy will moderate the positive relationship between functional diversity and firm performance. A portfolio strategy will strengthen the relationship between functional diversity and performance, whereas a standalone strategy will weaken this relationship.

3.2.4. The Moderating Effect of Alliance Strategy: Governance Diversity–Firm Performance Relationship

Research on alliance governance tends to be based on either the resource-based view or transaction cost theory. The resource-based view suggests that alliances are the outcome of resource integration among firms which allow partners to access valuable resources (Barney, 1991, Barney et al., 2001, Das and Teng, 2000). Governance structures are the organised method of transferring the resources and

knowledge from partner firms. From a transaction cost view, transferring resources and knowledge will incur costs of negotiation, monitoring and conflict resolving. Governance diversity refers to the extent to which a firm uses both equity and non-equity alliances. The greater number of different equity structures a firm has in its collection of alliances, the greater the governance diversity.

Strategic alliances are voluntary arrangements among firms where pooled or complementary resources are leveraged for competitive advantage (Ariño, 2003). Strategic alliance agreements can involve equity or non-equity. Equity alliance is formed by partners with unified governance in which partners contribute equity capital and share management control and risks (Wang and Nicholas, 2007). Profits and losses are shared among partners proportionally according to their equity capital contribution. Scholars suggest equity alliances are superior governance mechanisms for inter-firm learning and knowledge transfer (Kogut, 1988, Mowery et al., 1996). Equity alliance can also use ownership and profit distribution as an incentive to control opportunistic behaviours of partners and to facilitate the transfer of resources among partners. Equity alliance lacks strategic flexibility, as there is often a minimum requirement for investment and a certain restriction on the withdrawal of capital (Reuer et al., 2002, Reuer and Arino, 2007, Wang and Nicholas, 2007).

Non-equity alliances are formed by partners with either an arm's length contractual agreement or bilateral governance (Oxley, 1997, Reuer et al., 2002, Wang and Nicholas, 2007). Non-equity alliances are more flexible in terms of resource commitments (Wang and Nicholas, 2007). They rely on contracting arrangements where management control and the distribution of profit are based on negotiation among partners. Thus, although non-equity alliances can be more flexible, they can also incur additional costs, as the terms and conditions for the collaboration, such as transfer of resources and knowledge, are negotiated among partners (Williamson, 1991). Non-equity alliances tend to be of short duration and limited scope (Lavie et al., 2012). They can be established quickly to take advantage of short-term business opportunities and then be dissolved upon completion of the assignment.

Firms in non-equity alliances maintain independent identities. Their governance is not formally shared. Non-equity alliances are contractually based, and it can be difficult to specify and enforce terms and conditions in an alliance agreement for explorative types of alliances (Rothaermel and Deeds, 2004). For example, partners in a non-equity alliance may worry about value appropriation, as it can be difficult to specify a clear share of R&D outcome which is typically uncertain. Also, partners may often be reluctant to provide extensive information on the R&D projects due to fears of being cheated. Each partner may disguise or limit their contribution, and careful

monitoring of partners' activities becomes inevitable to control opportunistic behaviour (Gulati and Singh, 1998, Lavie et al., 2012, Oxley, 1997, Yang et al., 2014).

Firms are likely to have different forms of governance structures to manage their alliances. Sampson (2005) argues that firms who work with a few familiar structures (i.e. low governance diversity) will find it easier to institutionalise protocols related to the commonly adopted governance structure. Drawing on Sampson (2005), Jiang et al. (2010) provide empirical evidence that greater governance diversity is negatively associated with firm performance. The authors explain that operating a variety of different structures may result in high transaction costs as well as increasing managerial complexity and performance may suffer as a result.

Notwithstanding the above, high governance diversity provides more flexibility to the firm. Scholars note that it is important to match governance structure with each alliance so that it can achieve a balance between value creation and value appropriation (Lavie, 2007) and reduce transaction costs (Reuer and Arino, 2007). The firm can choose the governance structure to reflect different levels of commitment, integration and learning objectives (Kogut, 1988) as well as reducing uncertainty (Rothaermel and Deeds, 2004).

The impact of greater governance diversity on performance is still a matter of debate. I argue that governance diversity can lead to better or worse performance

outcomes depending on the firm's alliance strategy. Low governance diversity is easier to manage than high governance diversity, if there is a mechanism that allows managers to learn from previous alliances adopting similar governance structures. In a standalone strategy, managers only focus on one alliance at a time, and the interaction between alliances will be low. Hence, despite greater similarity in governance structures, the firm cannot fully leverage the learning that can be gained from similar alliance structures. For example, a firm with high governance diversity will have different types of agreements for non-equity alliances and different combinations of equity ownership. The management of these different contracts and ownership schemes can be costly. With a standalone strategy, managers tend to negotiate terms and conditions relating to the focal alliance for each new alliance, and it is unlikely that managers can learn from previous agreements. If there is little learning between alliances, then transaction costs might actually increase rather than decrease given the duplication of resources in operating similar governance structures. Therefore, a standalone strategy will reduce the positive impact of low diversity on performance.

In contrast, with a portfolio strategy, managers will encourage inter-firm learning in order to create synergies between alliances (Hoang and Rothaermel, 2005, Parise and Casher, 2003). For example, managers adopting a portfolio strategy may establish a central alliance function (Heimeriks, 2010, Ireland et al., 2002, Kale et al.,

2001, Kale et al., 2002, Kale and Singh, 2007, Kale and Singh, 2009) which manages and controls all the alliances-related matters, such as knowledge and resource management (Heimeriks and Duysters, 2007). For example, a portfolio strategy enables managers to use a firm's agreement repository to retrieve and re-use previous agreements, and many agreements may only require minor changes. This is likely to save on transaction costs. Similarly, a portfolio strategy may encourage a firm to establish common routines or share services between alliances when all alliances operate under similar structures (Sampson, 2005). The firm will be able to reap more benefits from prior experiences of working in similar governance structures in this way. Therefore, a portfolio strategy will enhance the positive effect of low diversity on performance.

With regards to high governance diversity, the literature suggests that having a mix of both equity and non-equity structures can bring more managerial complexity but also more flexibility to the firm. I argue that managerial complexity can be reduced and the benefits of flexibility fully leveraged with a portfolio strategy rather than a standalone strategy. When governance diversity is high, different governance structures increase managerial complexity. Park and Ungson (2001) argue that managerial complexity can increase due to lack of coordination and integration among independent firms. Alliances can fail as a result. Given that a portfolio strategy

promotes a holistic view, managers are better able to coordinate among alliances. Managers can jointly evaluate the costs and benefits of different governance structures and better manage the complexity inherent in high governance diversity. This means that managerial complexity can be reduced. Therefore, a portfolio strategy will reduce the negative impact that high governance diversity can have on performance.

Furthermore, high governance diversity, in principle, has the advantage of allowing the firm to balance different governance structures and spread the risk amongst all alliances. However, this is unlikely to occur when managers adopt a standalone strategy and only consider one alliance at a time. A standalone strategy encourages short-termism as it is more of a result-oriented strategy. Short-termism may create agency problems between alliance managers and the firm, as managers give priority to their own personal interests (Park and Ungson, 2001). If all managers only think about their personal interests and take up risky projects with a variety of governance structures in order to reap benefits more quickly, then the overall risk to the firm will increase. Consequently, the negative impact of high governance diversity on performance may be even greater.

In contrast, a portfolio strategy is less likely to suffer from agency problems, because alliance managers tend to look at the overall effects of different alliances rather than personal benefits. A portfolio strategy motivates managers to think

holistically about all alliances. Managers using a portfolio strategy need to weigh up different governance structures that fit into each particular alliance as well as how they fit with overall firm benefits. A portfolio strategy brings about a better coordination of the alliances. Furthermore, managers are more likely to think of ways to reduce overall risk within the alliance network. For example, partners' opportunistic behaviour is a common risk of alliances that needs to be minimised (Williamson, 1991). A portfolio strategy encourages firms to consider a variety of governance structures for minimising different levels of opportunistic behaviour.

In sum, a portfolio strategy encourages managers to manage complexity, minimise risk and encourage learning. Therefore, I argue that a portfolio strategy will reduce the negative impact of high governance diversity on performance and enhance the positive impact of low governance diversity on performance. With a standalone strategy, managers are unlikely to learn from similar alliance structures due to lack of coordination. Complexity inherent in having multiple governance structures may be overlooked, and there is a greater likelihood of risk-taking behaviour. Therefore, I propose that a standalone strategy will increase the negative impact of high governance diversity and reduce the positive impact of low governance diversity on performance.

Hypothesis 3 (H3): Alliance strategy will moderate the negative relationship

between high governance diversity and firm performance. A portfolio strategy will reduce the negative effect that high governance diversity can have on performance, whereas a standalone strategy will increase the negative effect of high diversity on performance.

3.3. Methodology

3.3.1. Sample

To test my hypotheses, I chose companies from China's and Taiwan's PCB (printed circuit board) industries and plastic rubber industries. These industries consist of manufacturing and contract manufacturing, equipment and machinery, materials, chemicals and accessories. Printed circuit boards are electronic components that are used in modern electronic goods and equipment. The majority of household appliances and electronic devices have PCBs as a key component to transfer electronic signals. Plastic rubber production can consist of a simple plastic bag to plastic moulding and injections. Plastic and rubber are used in every household as well as in many different industries.

Industrial statistics show that that global PCB output in 2014 was US$60.15 billion (WECC, 2015). Annual plastic rubber industrial facts data show that the industry turnover exceeds €350 billion in Europe alone (PlasticsEurope, 2015). A specialised industrial report suggests that PCB firms are going for partnership and strategic alliances in order to provide unique solutions and meet changing market demands and opportunities (Lucintel, 2015). Companies in the plastic rubber industry are often engaged in strategic alliances in order to have better control and flexibility in raw material supplies or sales channels. A recent example is AD Plastiks (Croatia)

and Henniges automotive (US), who formed strategic alliances to benefit from each other's specialisation in 2014. Burkool S.A (Brazil) and Henniges (US) formed alliances to serve Brazilian and Argentinian markets in 2013 (Sweeney, 2015). Companies in the PCB industry often use strategic alliances to collaborate with partners for different activities within the value chain. Firms from both industries are likely to have diverse sets of alliances. Therefore, these industries provide a large research setting to investigate the relationship between alliance diversity and firm performance. In addition, these firms' alliance diversity can be seen in their supply chain management. In order to better manage their supply and value chain, PCB and plastic rubber manufacturers collaborate with raw material manufacturers to supply materials and collaborate with their clients to develop new innovative products that suit the market.

Also, I chose to study firms in the two industries based in China and Taiwan because these two markets are ranked first and third worldwide in PCB output value. These two markets account for 44.9% and 14% of global PCB output, respectively. Together, they represent 58.9% of total PCB output worldwide (WECC, 2015). At the same time, China is ranked the largest producer and accounts for 26% of global plastic materials (PlasticsEurope, 2015). These are sizeable industries, and alliances are common practice, hence it appears to be appropriate for investigating firm alliance

strategy and how this strategy moderates the relationship between alliance diversity and firm performance.

3.3.2. Survey

Data collection was by questionnaire in this study. The questionnaire was prepared in English first and translated into Chinese. It was then translated back into English to ensure accuracy and reliability (Brislin, 1970, Kreiser et al., 2002). I contacted five senior managers of different companies from the PCB industry and asked for their help to verify the survey contents. Then a pilot test of the questionnaire was run with another five senior managers from the industry to further verify that it is easy for them to understand, so I could ensure that the operational measures are appropriate for the study. If there were suggestions for improvement, I amended accordingly and incorporated them into the final survey for distribution.

3.3.3. Data Collection

To verify the appropriateness of respondents, I contacted each executive in the sample companies by phone or in person and asked if decisions regarding strategic alliances would be within his or her authority, and if they were willing to participate in this study. When executives confirmed they have the authority to make strategic alliance decisions and were willing to participate in the survey, they then received the survey instrument via email, post, online or in person.

Each qualified respondent received the questionnaire with a letter to introduce and explain the purpose of the study as well as promising confidentiality. In order to ensure the response rate, I sent follow-up emails or made follow-up calls to check they had received the survey. I also attempted to establish a time frame for the return of the survey with each respondent.

Data were collected in 2016 using a random sample of 600 companies from the PCB and plastic rubber industries. For the PCB industry, I drew the sample from the directory for the PCB industry in Taiwan and China (TPCA, 2015). The directory comprises approximately 5,200 firms. I used random sampling to select every tenth firm in the list and sent out an invitation to 520 firms to participate in the study via e-mail and post. Out of the 520 firms contacted, 380 accepted to participate. I then sent out the questionnaire via post and email to these firms, and hand delivered approximately one fourth of the sample. After two waves of mailing, numerous follow-up calls, emails and company visits, I initially received 125 responses. Of these responses, three were not usable as these responses have too many un-answered questions. The useable surveys amounted to 122.

For the plastic rubber industry, the companies were sampled from the exhibitors list of Plas2016 Taipei industry exhibition. This includes approximately 500 firms. During the Plas2016 industry exhibition, I randomly approached 220 firms out of the

total number exhibiting there and received 71 responses, but three of these responses were not usable.

The usable data comprised 190 firms – 122 companies from the PCB industry and 68 companies from the plastic rubber industry. The overall response rate was 32% for PCB industry and 31% for Plastic rubber industry. On average, our respondents had 628 employees, and 65% of the firms had alliance function in the company with an average 21 alliances in the past five years.

3.3.4. Dependent Variable

The dependent variable for this study is firm performance. Previous alliance studies measure performance at alliance level, portfolio level or firm level, using objective measures or perceptual measures. For perceptual measures, scholars have used either actual performance or relative performance.

Performance measure at alliance level

At alliance level, Deeds and Rothaermel (2003) use a five-point Likert scale to measure three items of alliance performance: spill-over benefits, financial performance and overall alliance performance. The scale consists of descriptions on positive and negative spill-overs.[1] The respondents were asked to rate the spill-over

[1] "Positive spillover effects occur when knowledge that can be applied to profitably to other products is created during the alliance activities" and "Negative spillover effect is undesired transfer of a valuable skills or technology to an alliance partner"

effects of the present alliance, ranging from 1 ‘strongly negative’ to 5 ‘strong positive’. Financial performance of the alliance is based on respondents’ expectation, anchored by 1 ‘far better’ to 5 ‘far worse’. Respondents were asked to consider the most relevant financial performance, such as return on investment, burn rate and sales. Finally, the respondents were asked to rate their overall assessment of the alliance performance compared to their expectations, anchored by 1 ‘far better’ to 5 ‘far worse’.

Zollo et al. (2002) also studied alliance level performance using perceptual measures on a five-point Likert scale. Firstly, respondents rated their level of satisfaction with the knowledge accumulated from participating in a particular alliance. Secondly, respondents indicated the extent to which the alliance creates new opportunities for the firm. Thirdly, respondents indicated the degree to which the alliance satisfied the partnering firm’s initial objectives. The three indicators are then standardised and summed up to construct a global measure of alliance performance.

Hoetker and Mellewigt (2009)’s alliance performance measure is based on the degree to which the alliance achieves 13 different goals, ranging from firm-specific goals (e.g. cost reduction, risk reduction, time advantages) to industry-specific goals (e.g. access to network infrastructure, access to sales network, access to technical know-how). The final measure is the weighted average of the 13 items.

Lavie et al. (2012) measure alliance performance using an eight-item scale

which refers to the extent to which an alliance (1) met its objectives, (2) increased revenue, (3) improved quality, (4) reduced time to market, (5) generated new customers, products or projects, (6) led to customer satisfaction, (7) received favourable recognition, and (8) could evolve into a long-term relationship. Items were measured with a seven-point Likert scale from 1 ‘strongly disagree’ to 7 ‘strongly agree’.

Shu et al. (2014) measure alliance performance with a four-item Likert-type scale. Respondents are asked to rate the level of agreement with the following statements: (1) The collaborative relationship achieved the objective of return on investments, (2) The collaborative relationship achieved the objective of sales growth, (3) The collaborative relationship achieved the objective of market share increase, and (4) The collaborative relationship achieved the objective of net profits. With the anchor of 1 ‘strongly agree’ to 7 ‘strongly disagree’.

Performance measure at portfolio level

Schilke and Goerzen (2010) measured alliance portfolio performance by asking respondents to rate their level of satisfaction and goal fulfilment of the business unit’s R&D alliances. The statements were: (1) Overall, we are satisfied with the performance of our R&D alliances, (2) Generally, our R&D alliances satisfy our initial objectives, (3) We are satisfied with the knowledge accumulated from participating in

R&D alliances, and (4) Our R&D alliances have been profitable investments.

In Duysters et al. (2012) and Heimeriks et al. (2015), alliance portfolio performance is operationalised as the percentage of alliance in which the firm's goals are realised. More specifically, respondents assess their company's overall alliance success rate in the firm's portfolio where the initial goals were realised over the last five years. The question is, 'What is your company's overall success rate (i.e. percentage of strategic alliances where goals were realized) over the past 5 years?' Respondents select the success rate from 1 for (0-20%), 2 for (21-40%), 3 for (41-60%), 4 for (61-80%) and 5 for (81-100%).

Heimeriks and Duysters (2007) present a similar measure of alliance portfolio performance based on percentage of alliance in which the original goals were realised However, the authors use three levels of performance – low (0-40%), average (41-60%) and high (61-100%) – to indicate the level of alliance portfolio performance.

Kandemir et al. (2006) measure alliance network performance by capturing a firm's perceived ability to achieve its objectives associated with its alliance network. However, the authors use a seven-point Likert scale to ascertain respondents' satisfaction with: (1) The competitive strength of their alliance network, (2) The strength of their relationships with key alliance partners, and (3) The ability to manage crises and conflicts with their alliance partners.

Performance measure at firm level

For firm level of performance, scholars have used self-report measures based on surveys as well as accounting-based, market-based and innovation output measures based on secondary data. Accounting-based measures include return on assets (ROA), return on sales (ROS), return on investment (ROI) and earnings (e.g. Terjesen et al., 2011, Goerzen and Beamish, 2005, Lavie and Miller, 2008). Market-based measures are relevant to the stock market valuation (e.g. Wassmer and Dussauge, 2012, Lavie, 2007). Innovation output measures mainly look at the number of patents granted and the number of products introduced to the markets, e.g. (De Leeuw et al., 2014, Duysters and Lokshin, 2011, Lahiri and Narayanan, 2013).

Survey-based self-report measures are often related to the level of satisfaction with overall performance compared with competitors (Sarkar et al., 2009, Shu et al., 2014, Schreiner et al., 2009, Kandemir et al., 2006). In Kandemir et al. (2006), respondents are asked to rate firm performance relative to competitors in terms of sales growth, market share and market development, from 1 'much worse' to 5 'much better'.

Sarkar et al. (2009) measure market/firm performance by asking respondents to rate, from 1 to 5 ('much worse' to 'much better'), how well the firm performs relative to competitors for its market share, sales growth, market development and product development. This measure is adapted from Venkatraman and Ramanujam (1986). In

addition, as the sample studied has a number of public firms, Sarkar et al. (2009) test the validity of their measure by collecting three years of data on the public firms in their sample for commonly used performance measures (Return on Assets (ROA), Return on Equity (ROE) and Return on Investment (ROI) and Sales Growth (SG)) using COMPUSTAT and correlating the average performance data with their perceptual measure of market/firm performance. The correlation between market/firm performance and average ROA, ROE, ROI and SG are all significant at $p < 0.05$. This highlights the validity of the perceptual measure.

Schreiner et al. (2009) measure firm performance data by asking respondents to report how well their firm had performed during the last three years, relative to other direct competitors, in terms of sales growth, profitability, return on investment and ability to build customer loyalty. The respondents are asked to rate the level of firm performance compared with their key competitors on a seven-point Likert-type scale (ranging from 'far better' to 'far worse'). The question is: 'During the last three years, how well did your company perform relative to your direct competitors in terms of (1) Sales Growth, (2) Profitability, (3) Return on Investment, and (4) Building customer loyalty?'.

Shu et al. (2014) use four items to measure firm performance on a seven-point Likert scale. Respondents are asked to rate their level of agreement for the following

statements: (1) Compared with our major competitors, our return on investments increased greatly, (2) Compared with our major competitors, our sales grew greatly, (3) Compared with our major competitors, our market share increased greatly, and (4) Compared with our major competitors, our net profit increased greatly.

The choice of performance measure

There are a number of reasons for the choice of performance measure. Firstly, I chose firm-level performance because I am interested in the study of the relationships between alliance diversity, alliance strategy and firm performance. I am not interested in alliance-level or portfolio-level performance for my study. Secondly, I chose to use self-reporting measures because the sample in my study consists of listed and non-listed companies. Therefore, financial data is not available for all companies, and neither is adequate financial information on alliances readily available from secondary sources (Reuer, 2001, Hult et al., 2008). More importantly, many scholars suggest that top managers are highly knowledgeable about firm performance, and much of alliance research is based on managerial evaluation of performance (e.g. Heimeriks et al., 2014, Kale et al., 2002, Kale and Singh, 2007). In light of scale validity, Sarkar et al. (2009) demonstrate that their perceptual measure of firm performance is well correlated with financial data collected from COMPUSTAT. Thirdly, scholars suggest that using perceptual measures is more appropriate when comparing firms with different

business operations or firms with different attributes (Hult et al., 2008). In my sample, firms may engage in producing high technological PCBs (e.g. for the aviation industry and for advanced medical devices) or they may only produce low-end home appliance PCBs (e.g. for toasters or vacuum cleaners). The profit margin for the former group is normally higher than that of the latter group due to the nature of its product line. In this case, objective measures of performance are not comparable and can be misleading. Perceptual measures of performance related to competition can provide more comparable information, and control for industry effect (Judge and Douglas, 1998). Fourthly, scholars suggest that comparisons with competitors can reveal important firm performance information (Wiklund and Shepherd, 2003).

Following Sarkar et al. (2009)'s performance measure, I asked respondents to rate the level of firm performance compared with their key competitors on a seven-point Likert-type scale (ranging from 'Far Better' to 'Far Worse'). The question is: 'How well does your company perform relative to your competitors in terms of (1) market share, (2) sales growth, (3) market development and (4) product development?'

3.3.5. Independent Variables

The independent variables are the different kinds of alliance diversity. Alliance diversity is a multidimensional concept that may include a variety of alliance and partner attributes (Jiang et al., 2010, Wassmer, 2010, Lee et al., 2014). Scholars have

measured alliance diversity in different ways. The most frequently studied kinds of alliance diversity include functional, governance, industry, national, technology, organisational and partner diversity (Lee et al., 2014). I follow Jiang et al. (2010) and use the three main kinds of alliance diversity which are partner diversity, functional diversity and governance diversity. These three kinds of diversity are very relevant to alliance formation as well as to alliance strategy because they are concerned with who the partners are, what activities are performed in the partnership and how the alliance is managed.

Partner diversity

Scholars have measured partner diversity by studying nationality/geographic diversity (Jiang et al., 2010), partner attributes diversity (van Beers and Zand, 2014) and partner types (Terjesen et al., 2011). Scholars suggest that partners from different stages of the value chain may contribute to knowledge sharing and transfer differently. However, partnering with competitors may cause intensified competition (Jiang et al., 2010, Lee et al., 2014). Partners from different geographical areas will bring different resources to the alliances (Doz and Hamel, 1998, Goerzen and Beamish, 2005). Therefore, in this study, I followed Terjesen et al. (2011), who include partner type and geographic diversity as the partner diversity variable. Partner types include suppliers, competitors and customers, because firms in the sample industries appear to be very

active in forming alliances from different stages of the value chain. Respondents were asked to specify the number of their firm's alliances with (a) suppliers, (b) competitors and (c) customers. For geographic diversity, respondents were asked to report the number of their firm's alliances which are (a) domestic and (b) international.

Functional diversity

Functional diversity is the variety of different functional purposes of partners such as marketing, R&D, manufacturing and distribution. Scholars suggest that functional diversity has a significant effect on performance (Jiang et al., 2010, van Beers and Zand, 2014). I asked respondents to specify the number of different functional alliances their firms are currently engaged in. The respondents were asked to report the number of alliances they have within each different function. The functional categories are Sales and Marketing, Research and Development, Manufacturing, Distribution, and Others.

Governance diversity

Governance diversity refers to the way in which an alliance is governed. This can be either equity alliance or non-equity alliance. Scholars suggest that governance diversity is negatively related to performance (Jiang et al., 2010). I asked respondents to specify the number of equity-based alliances and the number of non-equity based alliances their companies are currently involved in. The questions are: '(1) How many

of the alliances your firm is currently involved in are equity based?', and '(2) How many of the alliances your firm is currently involved in are non-equity based?'

The measure of diversity

For the measure of diversity, I follow Jiang et al. (2010) using a Blau Index. The formula to calculate this index is:

$$Diversity = 1 - \sum P_i$$

D represents degree of diversity, *P* is the proportion that belongs to a given category, and *i* is the number of different categories. For example, if a firm has five alliances with two domestic partners and three international partners, the geographic diversity would score $1 - [(2/5)^2 + (3/5)^2] = 0.48$. Higher values indicate a greater degree of diversity.

3.3.6. Moderating Variable

The moderating variable is the firm's alliance strategy. In this study, alliance strategies are distinguished as a standalone alliance strategy or a portfolio alliance strategy. To my knowledge, there are no published scales for standalone and portfolio strategies, because prior studies have not viewed alliance strategy based on the standalone versus portfolio distinction. The main reason for the lack of availability of tested scales is that, traditionally, alliance research has tended to focus on single

alliances. In recent years, some scholars have suggested a portfolio approach as an alternative way for firms to manage strategic alliances (Hoffmann, 2005, Hoffmann, 2007, Ozcan and Eisenhardt, 2009). The majority of alliance studies treat the two types (standalone and portfolio) as two separate research areas, and scholars do not view them together as firm alliance strategy. Therefore, scholars have not created scales that might distinguish standalone from portfolio strategy.

Other reasons for the lack of tested scales are the definitions and level of measurement used for the different strategies. Scholars tend to define standalone alliance with more consensus but define an alliance portfolio quite differently (Wassmer, 2010). For example, some scholars define an alliance portfolio as the aggregate of all strategic alliances of a focal firm (Bae and Gargiulo, 2004, George et al., 2001, Hoffmann, 2005, Hoffmann, 2007, Lavie, 2007, Lavie and Miller, 2008). Other scholars define it as all direct ties with partner firms (Baum et al., 2000, Ozcan and Eisenhardt, 2009, Rowley et al., 2000). Another group of scholars define the alliance portfolio as a focal firm's accumulated alliance experience, both ongoing and in the past (Anand and Khanna, 2000, Hoang and Rothaermel, 2005, Kale et al., 2002, Reuer et al., 2002). Different definitions may cause difficulties in operationalising the variable. In addition, standalone and portfolio appear to have different levels of analysis. Therefore, scholars have not created a scale that combines the two levels of

analysis and measurement, or that reflects the managerial choice of firms' alliance strategies. Furthermore, alliance portfolio research is still relatively new and scholars have yet not conceptualised alliance strategy as standalone and portfolio.

For this study, I used DeVellis (2012) scale development guidelines to create a new scale of alliance strategy. Firstly, DeVellis (2012) suggests scholars define what the study needs to measure and to draw on literature to develop a suitable number of item scales. Therefore, as recommended by DeVellis (2012), I provided a definition of alliance strategy and used the literature to develop a three-item scale. Secondly, DeVellis (2012) suggests seeking out industry experts for clarification and verification of the items developed. I therefore contacted the senior managers of different companies in the target sample industry to carry out this task. Thirdly, DeVellis (2012) recommends that the scale should be reviewed by academic experts and scale length optimised. Fourthly, this initial measure will be tested by a second set of senior executives from the sample industry. Finally, items are modified, based on the feedback of the test with the second set of senior executives, to finalise the questionnaire.

In the literature, scholars identify the motivations and benefits of forming strategic alliances, such as achieving long-term strategic goals, managing risk and uncertainty, and accessing resources for synergy creation and resource integration

(Ahuja, 2000b, Gulati, 2007, Hoffmann, 2007, Lavie, 2006, Ozcan and Eisenhardt, 2009). These are the core strategic considerations for firm alliance strategy. Therefore, I developed this measure based on my definitions of alliances strategies, and taking account of the core strategic considerations suggested in the literature. The aim of this study is to examine the extent to which managers view alliances as standalone occurrences or as a portfolio. Therefore, I needed respondents to be able to distinguish between the two kinds of strategies. In doing so, it is important to highlight the opposing characteristics of the two strategies. At the same time, scholars often present portfolio perspective as a step up from the standalone perspective (Parise and Casher, 2003). Therefore, standalone and portfolio strategies can be presented as a continuum, using an anchored Likert scale. The first item uses generic descriptions of the standalone strategy and portfolio strategy. The other two items are related to core strategic considerations for firm alliance strategy.

In item 1, I developed two descriptive statements that are based on my definitions of the two strategies. Scholars have found that the use of descriptive paragraphs is an effective means of determining a firm's strategy (James and Hatten, 1995). Therefore, I used descriptive statements at both ends of the continuum to measure a firm's alliance strategy. The statement for a standalone strategy is, 'When we make alliance decisions, each alliance is considered as an independent entity and

there is a specific goal for each alliance independently from other alliances'. Portfolio strategy is described as 'When we make alliance decisions, we take into account the strategic implications of all alliances that our company is engaged in, and we consider the interrelationships among alliances, including the possible synergies that can be created through the combination of the alliances'. The respondents were asked to rate which statement best describes their company's alliance strategy on a continuum (ranging from 1 to 7). Firms that choose toward 1 are inclined to a standalone alliance strategy and firms that choose toward 7 are inclined to a portfolio alliance strategy.

In item 2, I developed two descriptive statements on the importance of short-term versus long-term outcomes during alliance formation. The idea is inspired by Ozcan and Eisenhardt (2009). The authors suggest that managers who are able to view their alliances in the context of their firm's industry are likely to develop a high-performing alliance portfolio. I interpret that these managers with a long-term perspective are more likely to take a portfolio strategy. I developed a scale of 1 to 7 whereby 1 is, 'we mainly consider a short-term outcome during alliance formation', and 7 is, 'we mainly consider a long-term alliance development goal during alliance formation'. I asked respondents to indicate the level of prioritisation for either orientation rather than importance, because respondents may feel that both short- and long-term outcomes are important when asked this question. By assessing how

managers perceive the level of prioritisation, I was able to gauge the tendency of a firm's alliance strategy: managers adopting a standalone strategy tend towards short-termism, whereas managers adopting a portfolio strategy are more concerned with long-term viability and development.

For item 3, I drew on literature related to alliance risk and uncertainty. Strategic alliances allow firms to manage risk and uncertainty (Hoffmann, 2007, George et al., 2001). Managers tend to have different risk propensities, and strategic choices are influenced by the risk preference of the decision makers (Hoffmann, 2007). I asked respondents how they manage alliance risk and uncertainty by using two descriptive statements. At one end of the continuum, the statement reads, 'We manage risk and uncertainty of individual alliances in an independent manner'. At the other end of the continuum, the statement reads, 'We manage risk and uncertainty of all alliances together in an integrated manner'. When managers do not view managing risk and uncertainty in an integrated manner, they are likely to adopt a standalone strategy, because a standalone strategy is less concerned with managing overall risk and uncertainty whereas a portfolio strategy encourages managers to consider the risk implications of different alliances together. Therefore, having a manager's view on risk and uncertainty can indicate the tendency of choosing an alliance strategy.

Each item reflects the core strategic considerations of forming alliances. These

statements indicate the tendency of managerial strategic consideration during alliance decision-making. At one end of the spectrum are those firms whose alliance strategy is to take holistic view on their alliances and have a long-term perspective into forming alliances, managing overall risk and uncertainty (Parise and Casher, 2003, Vapola et al., 2010, Vassolo et al., 2004, Hoffmann, 2007). These firms are likely to have a portfolio alliance strategy. At the other end of spectrum are firms whose alliance strategy is more on a standalone, ad hoc basis, is short-term result oriented, more focused on risk and uncertainty related to individual alliance and less concerned with the overall effects of alliances joining together. These firms are likely to have a standalone alliance strategy. Therefore, the three-item Likert scale for alliance strategy can tap into a firm's alliance strategic orientation and is suitable for the measurement of alliance strategy.

3.3.7. Control Variables

In order to minimise alternative explanations and isolate the marginal effects of the different variables, I controlled for several characteristics of the focal firm and of its alliances as well as managerial characteristics. For the focal firm, I controlled for firm size, firm age, international activities, R&D orientation, past performance, two industrial effects and a country effect. For the characteristics of the alliances, I included alliance experience and alliance function. For managerial characteristics

control variables, I controlled for respondents' age, education, tenure and functional background. These variables may have a confounding effect and influence on the diversity and performance relationship.

Firm size

Large firms will have more resources to establish alliances and may have more experience too, which may have a possible effect on firm performance (Brouthers et al., 2014). Therefore, I used total number of employees to control for the effect of firm size on firm performance. Firm size was measured as the number of full-time employees.

Firm age

Older firms may have more experience in forming alliances which could have an experiential effect on firm performance (Hoang and Rothaermel, 2005). Firm age was measured as the number of years since its founding until 2016. I asked respondents to provide the founding year of the firm.

International activities

Similar to Brouthers and Nakos (2005), I controlled for a firm's export dependency because firms that are highly dependent on exports may impact performance differently to firms less dependent upon export sales. Therefore, it is included as a control variable. I followed Brouthers and Nakos (2005) and

operationalised it as the firm's ratio of foreign sales to total sales. I asked respondents to report the ratio of their foreign sales to total sales.

R&D orientation

Gatignon and Xuereb (1997) define an R&D oriented firm as 'a firm with the ability and the will to acquire a substantial technological background and to use it in the development of new products'. Scholars suggest that R&D orientation is related to firm performance outcomes (Cooper, 1984, Gatignon and Xuereb, 1997). It is likely that a firm with a high degree of R&D orientation may influence firm performance. Therefore, I followed Schilke and Goerzen (2010) by including R&D orientation as a control and using a single item to measure this variable. Respondents were asked to indicate the level of agreement with the statement on a seven-point scale, ranging from 1 'strongly disagree' to 7 'strongly agree'. The statement is: 'In our company, we emphasise Research and Development activities'.

Past performance

Past performance may influence firm alliance strategy because a firm may take strategic action based on past performance in an attempt to improve firm performance. This means that past performance has a potential effect on a firm's choice of alliance strategy and future performance. Previous studies control for past performance using different measurements and time frames (Baum and Wally, 2003, Wiklund and

Shepherd, 2003, Santhanam and Hartono, 2003, Andrevski et al., 2013). For example, Baum and Wally (2003) measure past performance with two types of firm performance: growth and profitability. Growth is measured with two items: (1) the percentage change in annual sales from 1996 to 2000, and (2) the percentage change in year-end employment from 1996 to 2000. Profit is measured with one item: the average annual 'pretax net profit percentage of assets' for 1998, 1999, and 2000. Wiklund and Shepherd (2003) directly ask respondents to compare past performance with competitors in terms of net profit, sales growth, cash flow and growth of net worth. The items use a five-point Likert scale, ranging from 1 'much worse than its competitors' to 5 'much better than its competitors'. Cronbach alpha is 0.76. Santhanam and Hartono (2003) take into account past performance, not through a control variable but by adjusting current performance. The authors measure financial performance in two categories: profit ratios and cost ratios. Profit ratios include return on sales, return on assets, operating income to assets, operating income to sales and operating income to employees. Cost ratios include: cost of goods sold to sales, selling and general administration expenses to sales and operating expenses to sales. Data are collected from a secondary data source (COMPUSTAT) for current and previous years. Past performance is controlled through adjusting current performance, by regressing prior year performance on current year performance. In alliance studies, Andrevski et

al. (2013) control for past performance using return on equity (ROE), and data are collected from a secondary source.

Past performance based on financial data is relatively accessible. However, tested scales for past performance measurements are relatively limited. I followed Schreiner et al. (2009)'s performance measure because it is used in the context of alliance and it asks respondents to rate their firm's performance compared to its competitors over a three-year time frame. This appears to be relevant for measuring a firm's past performance. Schreiner et al. (2009)'s measure is similar to Wiklund and Shepherd (2003)'s measure of past performance, but the items are different. Wiklund and Shepherd (2003) consider net profit, sales growth, cash flow and growth of net worth, while Schreiner et al. (2009) consider sales growth, profitability, return on investment and building customer loyalty. The Cronbach alpha for Schreiner et al. (2009) is higher at 0.93, and Wiklund and Shepherd (2003) is at 0.76. Therefore, following Schreiner et al. (2009), I asked respondents to rate the level of firm performance compared with their competitors on a seven-point Likert-type scale (ranging from 'Far Better' to 'Far Worse'). The question is: 'During the last three years, how well did your company perform relative to your direct competitors in terms of (1) Sales growth (2) Profitability (3) Return on investment (4) Building customer royalty?'

Industry effect 1& 2

Strategic alliances in certain high technology industries may be more active than others (Hagedoorn, 2002). Also, alliances in some industries perform better than those in other industries owing to differences in industry structure (Krishnan et al., 2006). Hitt and Tyler (1991) found that industry affects the criteria used to make acquisitions. Many scholars have argued the importance of industry in determining the strategies employed by the firms (Hitt et al., 2000). Scholars suggest that it is important to include an industry effect as a control variable. I used Schilke and Cook (2013)'s opening question 'Which of the following is your company's primary industry sector?', but provided a selection list based on the primary industry in my sample: 1 for Manufacturing and Contract Manufacturing, 2 for Equipment and Machinery, 3 for Materials, Chemicals and Accessories, and 4 Other, please specify. This was coded as dummy variables, 1 (One) for Manufacturing and Contract Manufacturing, 0 (Zero) for all other industries.

In addition, another industrial control is included to distinguish companies from the PCB industry and companies from Plastic rubber industry. This was also coded as a dummy variable.

Country effect

This effect is also coded as a dummy variable in order to distinguish the differences between firms from China and firms from Taiwan. Although they are similar and may be considered as the same country, managerial concepts and practices may be different. Institutional theory suggests that different countries may have different institutional distance as well as psychic distance (Brouthers, 2013b, Brouthers et al., 2008). China and Taiwan do have different legal and institutional practices. This is likely to have an impact on managerial strategic orientation; therefore, it is important to control for possible differences.

Alliance experience

Alliance experience is concerned with the extent to which a firm has been involved in strategic alliances (Schilke and Goerzen, 2010). It is likely that a firm more experienced in strategic alliances may have a better performance. It has the potential to influence the relationship between diversity and firm performance. Therefore, it is included as a control variable. Following Zollo et al. (2002) and Schilke and Goerzen (2010), where alliance experience is measured as the number of strategic alliances within the past five years, respondents were asked to indicate the number of strategic alliances formed by the firm within the past five years.

Alliance function

Alliance function is defined as 'a position to manage or coordinate all alliance-related activity in the firm' (Kale et al., 2002). When a firm has an alliance function, this function manages all alliance-related operations. It may influence how the firm forms and manages its alliances, and potentially influence alliance strategy. Also, scholars have shown that firms with alliance functions achieve better performance results (Kale et al., 2002). Thus, alliance function can also influence firm performance. Therefore, alliance function has been included as a control variable. I followed Kale et al. (2002)'s definition and asked respondents to indicate whether their company has a formal, dedicated alliance function or department that is responsible for their firm's alliances.

Respondent's age

Executive's age may influence strategic decision-making because it is related to risk propensity and a manager's experience (Brouthers et al., 2000, Bantel and Jackson, 1989, Hambrick and Mason, 1984, Wiersema and Bantel, 1992). Potentially, age may affect the moderating effect of alliance strategy because studies have shown that executives' age is related to risk propensity and firm strategic choice (Brouthers et al., 2000, Hitt and Tyler, 1991). Thus, it is likely to influence the choice of alliance strategy. Therefore, I included age as a control variable. I used the age measure of

Brouthers et al. (2000), whereby age is a continuous two-digit number reported by each respondent.

Education

I controlled for three education-related variables: educational level, major in business, and elite education, because educational backgrounds may influence managerial strategic orientation (Hitt and Tyler, 1991, Brouthers et al., 2000) and potentially influence firm alliance strategy. More highly educated managers may develop better cognitive abilities which affect how they formulate alliance strategy. Different education specialisations tend to have different decision rules developed through particular academic training, which may influence the choice of alliance strategy. Therefore, major in business is a control variable. In addition, managers with an elite education may have more valuable social capital (Cao et al., 2012), which may present more opportunities for alliance formation and influence their alliance strategy. For educational level, I followed Brouthers et al. (2000) and Bantel and Jackson (1989). Five categories were provided ranging from junior high school and below to doctorate degree (i.e. junior high school, high school, undergraduate degree, master's degree and doctoral degree). The categories of educational levels have been changed to reflect the education systems in China and Taiwan. I asked respondents to select the education level attained from the following categories: 1 for Junior High School and Below, 2

for High School Education, 3 for Undergraduate degree, 4 for Master's Degree and 5 for Doctor of Philosophy (Ph.D.).

For major in business, I included 10 categories to reflect the major areas of study in China and Taiwan. These categories were chosen from Bantel and Jackson (1989), Hitt and Tyler (1991) and Wiersema and Bantel (1992). The respondents were requested to choose from the following: 1 for Accounting/Finance, 2 for Sociology and Social Studies, 3 for Art and Design, 4 for Science, 5 for Law, 6 for IT and Computing, 7 for Business/Management/Marketing, 8 for Engineering, 9 for Language, and 10 for Other Fields (that respondents can specify). When coding, this variable is coded as a dummy variable, 0 (Zero) for Major in business such as 1 for Accounting/ Finance and 7 for Business/Management/Marketing, 1 (One) for all other categories.

For elite education, I asked respondents to specify the education establishments they have attended for undergraduate and postgraduate studies in an open-ended question. When coding, I referred to the ranking of the respondent's university in their country of education (See appendix A and B for China and Taiwan). If respondents are educated overseas, I checked with the university ranking in the corresponding countries. If overseas-educated executives graduated from the top 20 education institutions in their specific countries, they were considered as graduating from elite

universities. The variable was coded as 0 (Zero) if the respondent did not complete a formal degree or did not have any degree from an elite university. Coded for 1 (One) if the respondent had either an undergraduate degree or postgraduate degree from an elite university.

Tenure

I controlled for executive's tenure. Tenure can be categorized into three types: positional tenure, firm tenure and industrial tenure. For this study, I used positional tenure as a control variable. Positional tenure is defined as the number of years a top executive has been employed in his or her current position. Positional tenure may influence strategic decision-making, because managers may build and obtain different firm knowledge and social capital in different stages of the tenure (Hambrick and Fukutomi, 1991). I followed Bantel and Jackson (1989), and asked respondents to specify the year he/she joined the current company and his/her current position. Tenure is thus a continuous measure.

Functional background

Executive functional background may influence managerial strategic choice (Hambrick and Mason, 1984, Waller et al., 1995), and potentially influence the moderating effect of firm alliance strategy, because functional background influences how executives develop their knowledge, skills and strategic orientation (Herrmann

and Datta, 2006). Their functional background determines what particular skill set they have, which is likely to influence firm alliance strategy. For example, Geletkanycz and Black (2001) document that executives in the functional areas of finance, marketing, law and general management are most strongly related to strategic commitment to the status quo. This implies that these managers may be less willing to formulate new strategies and influence the choice of firm alliance strategy. Therefore, it has been included as a control variable. I drew on Bantel and Jackson (1989) for the opening question 'The functional area in which you had the most experience?' and followed Bunderson and Sutcliffe (2002) for the categories to select from, because their categories are more suited to my sample industry (i.e. sales or marketing, manufacturing, finance or accounting, personnel/HR, distribution or warehouse, R&D, equipment management, administrative support and general management). Functional background was coded as a dummy variable, 0 (Zero) for all other functional backgrounds (manufacturing, distribution or warehouse, R&D, equipment management, finance accounting, personnel/HR, administrative support and general management) and 1 (One) for output functional background (sales and marketing).

3.3.8. Statistical Analysis

Firstly, I analysed the data composition of the sample such as key statistics of the firm (e.g. firm size, international activities and alliance experience) and response

rate. Secondly, I tested for common methods variance, and reliability and validity statistically.

Common methods variance

As with all self-reported data, there is a potential for common method bias resulting from a single-respondent response (Chang et al., 2010, Podsakoff et al., 2003). In order to prevent common method bias, I followed the suggestions from Chang et al. (2010) and Podsakoff et al. (2003). Firstly, through the design of the study's procedure, Chang et al. (2010) suggest using different response formats to measure different variables when designing the questionnaire. For the dependent variable, a four-item seven-point Likert-type scale is used to measure firm performance. For the independent variables, I used a mixture of open-ended questions and listed choices for selection. These can prevent respondents choosing the same response pattern, which may affect the accuracy of data (Brouthers et al., 2000).

Secondly, factor analysis was used, in which all items from each of the constructs load into an exploratory factor analysis to determine whether the majority of the variance between measures can be accounted for by one general factor (Chang et al., 2010). The logic behind this test is that if common method variance is a serious issue in the data, a single factor will emerge, or one general factor will account for most of the covariance in the dependent and independent variables (Podsakoff et al.,

2003). If the model does not achieve an acceptable fit, then it should not have a single common method factor. This statistical test can increase the reliability of the data for interpretation (Brouthers et al., 2003). However, Chang et al. (2010) and Podsakoff et al. (2003) suggest that factor analysis is not sufficient to claim common method variance is not an issue. Confirmatory factor analysis (CFA) would be used to overcome the drawback of the one-factor test and further test potential common method bias among the variables in my survey (Podsakoff et al., 2003).

Reliability and validity

Before testing the hypotheses, I used factor analysis to evaluate the validity of the measures. The factor analysis can verify if the model fits satisfactory with the data. If the results show that all standardised item loadings are significantly greater than zero ($p \leq 0.01$), positive and high in magnitude (≥ 0.65), they present evidence of convergent validity (Hair et al., 2010).

I also conducted further testing for firm performance, past performance and alliance strategy constructs using Cronbach's alphas (α) and average variances extracted (AVE) for these multi-item constructs. The result is reported and presented in Table 3-2. If all three values for firm performance, past performance and alliance strategy exceed the recommended thresholds, i.e. (α) ≥ 0.7, (CR) ≥ 0.7 and (AVE) $\geq$

0.5, then firm performance and the alliance strategy measures demonstrate adequate convergent validity and reliability (Bagozzi and Yi, 2012, Bagozzi and Yi, 1988).

Hypotheses Testing

For hypotheses H1 to H3, hierarchical regression analysis would be used to test for the moderating effects of alliance strategy in SPSS.

3.4. Results

3.4.1. Validity and Reliability

Factor analysis and Cronbach's alpha were used to examine validity and reliability on multi-item constructs. Average Variance Extracted (AVE) and Cronbach's alpha are indicative of reliability and validity for each individual construct (Hair et al., 2010, Schilke and Goerzen, 2010). The AVE and Cronbach's alpha for firm performance are 0.74 and 0.88, respectively. For past performance, AVE is 0.76 and Cronbach's alpha is 0.89. For alliance strategy, AVE is 0.76 and Cronbach's alpha is 0.84 (See Table 3-2). The table shows that all items load onto their predicated variable significantly with acceptable AVE and Cronbach alpha.

Table 3- 2: Factor analysis and Cronbach alpha

FACTOR ANALYSIS AND CRONBACH'S ALPHA			
N = 190	Eigenvalue	Average Variance Extracted Factor loading	Cronbach alpha
Firm Performance			
Currently, how well is your company performing relative to your competitors in terms of:	2.964	74.059	
1. Market share		.842	0.883
2. Sales growth.		.868	
3. Market development		.897	
4. Product development		.835	
Past Performance			
During the last 3 years, how well did your company perform relative to your direct competitors in terms of?	3.04	75.997	
1. Sales growth		.841	0.894
2. Profitability		.920	
3. Return on Investment		.880	
4. Building customer loyalty		.844	
Alliance Strategy	2.272	75.746	
When we make alliance decisions, each alliance is considered as an independent entity and there is a specific goal for each alliance independently from other alliances **VERSUS** When we make alliance decisions, we take into account the strategic implications of all alliances that our company is engaged in, and we consider the inter-relationships among alliances, including the possible synergies that can be created through the combination of the alliances		.919	0.839
We mainly consider short-term outcome during alliance formation **VERSUS** We mainly consider long-term alliance development goal during alliance formation		.872	
We manage risk and uncertainty of individual alliances in an independent manner **VERSUS** We manage risk and uncertainty of all alliances together in an integrated manner		.817	

In addition, correlation analysis was conducted. I checked the correlations between variables. The majority of inter-item correlations between those variables are all relatively low, generally falling between 0.0 and 0.6. There is one exception which has correlation values exceeding 0.6 – that is the correlation between performance and past performance ($r = 0.726$). This is not a concern, as the correlation occurs between control and dependent variable, which is acceptable. As summarised in Table 3-2, the majority of inter-item correlations between those variables are relatively low, at low to moderate levels. This is one indication that the variables are unidimensional, and that there exists, as a result, good validity which does not threaten discriminant validity.

Furthermore, I examined the variance inflation factors (VIF) in our regression tests (See Table 3-3) and found that all VIF scores were less than 2.5, indicating a low probability of collinearity.

Table 3- 3: Correlation matrix with means and standard deviations

Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Mean	19.358	26.032	627.503	44.676	6.005	0.653	21.332	18.968	0.295	0.642	0.942	0.000	0.000	0.347	0.416	0.000	0.358	0.000	0.000	0.000	0.000	0.090	-0.020	0.066
	Standard Deviation	3.535	15.748	1931.820	25.842	0.892	0.477	19.972	3.627	0.457	0.481	0.234	1.000	1.000	0.477	0.494	1.000	0.481	1.000	1.000	1.000	1.000	0.966	0.903	1.095
1	Firm Performance	1																							
2	Firm Age	.176*	1																						
3	Firm Size	.036	.337**	1																					
4	International Sales	.068	.152*	.203**	1																				
5	RD Orientation	.428**	.137	-.034	.067	1																			
6	Alliance Function	.156*	.152*	.094	.208**	.129	1																		
7	Alliance number	.015	.331**	.272**	.322**	.092	.304**	1																	
8	Past Performance	.726**	.172*	.054	.115	.406**	.120	.022	1																
9	Industry effect 1	.096	.098	.304**	-.156*	.126	.205**	-.015	.100	1															
10	Industry effect 2	-.067	-.103	.189**	-.201**	-.144*	-.037	-.322**	-.043	.483**	1														
11	Country effect	.041	.140	.019	.231**	.229**	.103	.105	.069	.012	-.185*	1													
12	Age	.048	.172*	.179*	.047	.232**	.165*	.045	-.059	.263**	.127	.197**	1												
13	Educational Level	-.037	-.086	.031	.079	-.194**	.059	.074	.003	-.102	.133	-.143*	-.259**	1											
14	Major in business	.022	-.037	.000	.066	.126	.114	.021	.145*	-.132	-.124	.086	-.085	.095	1										
15	Elite Education	-.039	-.047	.180*	.137	-.233**	.077	.079	-.032	.110	.251**	-.065	.003	.517**	-.055	1									
16	Tenure	-.002	.110	.019	-.036	.197**	.002	-.110	.009	.095	.155*	.106	.537**	-.253**	-.046	-.019	1								
17	Output Functional background	.136	-.063	-.057	.037	.026	-.193**	-.064	.110	-.097	.122	-.003	-.264**	.071	.078	-.028	-.223**	1							
18	Partner Diversity	-.035	-.038	.013	.112	.197**	.331**	.256**	.014	.118	-.177*	.206**	.114	-.010	.076	-.017	-.069	-.034	1						
19	Functional Diversity	.153*	.161*	.046	.067	.271**	.212**	.257**	.057	.119	-.305**	.184*	.150*	.006	-.048	-.056	.003	-.199**	.395**	1					
20	Governance Diversity	.021	-.145*	.071	.193**	-.007	-.028	.093	-.021	.017	.238**	-.065	-.029	.137	-.037	.176*	-.060	.051	.005	-.074	1				
21	Alliance Strategy	.239**	.065	-.002	.066	.176*	.256**	-.067	.278**	.320**	.260**	.049	.046	.078	-.010	.083	.130	.077	.091	-.020	.066	1			
22	Partner Diversity X Alliance Strategy	.103	-.092	.071	-.075	-.129	-.097	-.105	-.024	.000	.107	-.175*	-.040	.035	-.043	-.005	-.083	.051	-.219**	-.094	-.109	.027	1		
23	Functional Diversity X Alliance Strategy	.004	.021	-.053	-.142	-.088	-.088	-.065	-.114	.082	.069	-.089	.027	-.051	-.059	-.031	.076	.022	-.100	.095	-.115	.067	.392**	1	
24	Governane Diversity X Alliance Strategy	.056	-.026	.047	.116	-.101	-.083	-.188**	.023	-.063	.011	-.005	-.144*	.200**	-.012	.024	-.073	.055	-.096	-.095	.231**	.129	.073	-.076	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

3.4.2. Hypotheses Testing

I used hierarchical regression to test my hypotheses. The first regression model includes the sixteen control variables only – firm age, firm size, international sales, RD orientation, alliance function, alliance number, past performance, two industrial effects and country effect, followed by managerial characteristics of executive age, educational level, major in business, elite education, tenure and output functional background. The second model adds alliance diversities as the independent variables – partner, functional and governance diversities. The third model includes all the main effects. I included controls, independent variables and the moderating variable – alliance strategy. Firm performance was the dependent variable in the three models.

Models 4, 5 and 6 examine the moderating influence of alliance strategy between alliance diversities and firm performance. For each of these models, I compared the increase in explanatory power to the main effect (Model 3). The results are shown in Table 3-3. In each of these models, one interaction term (alliance strategy by one of alliance diversities) was entered after the base model. By entering each interaction term after the base model singularly allows one to see the changes in R^2 are relevant to a particular interaction. Thus, any significant improvements in R^2 are attributable to the interaction. Firm performance was the dependent variable in the three models.

Model 1 includes all control variables only and is significant with F-statistic of 15.386 at a significant level of ($p < 0.01$). Six control variables were significantly related to firm performance. The six control variables were: RD orientation ($p < 0.01$), alliance function ($p < 0.1$), past performance ($p < 0.01$), age ($p < 0.1$), major in business ($p < 0.05$) and output functional background ($p < 0.05$). The control variables in Model 1 accounted for 58.7% ($p < 0.01$) of variance in firm performance.

In Model 2, I added the independent variables. The three different diversities as independent variables accounted for an increase of significant 2.4% of the variance in firm performance in R^2 compared to Model 1. F-statistic is significant at ($p < 0.01$). Model 2 shows that the results of control variables are similar to Model 1, except for some changes in significant level, RD orientation from ($p < 0.01$) to ($p < 0.05$), alliance function from ($p < 0.1$) to ($p < 0.05$) and major in business from ($p < 0.05$) to ($p < 0.1$). For the independent variables, Model 2 shows that partner diversity ($p < 0.01$) and functional diversity ($p < 0.05$) are significant predictors of firm performance. However, governance diversity is not statistically significant.

Model 3 tested the direct main effects of control variables, independent variables and the moderator. The result shows a small R^2 change of 0.01 compared to Model 2, although F-statistics was significant ($p < 0.01$), R2 change was not significant as the moderating variable – alliance strategy was not significant. Model 3

shows that the six control variables were significantly related to firm performance as in Model 2. The six control variables were: RD orientation ($p < 0.05$), alliance function ($p < 0.05$), past performance ($p < 0.01$), age ($p < 0.1$), major in business ($p < 0.1$) and output functional background ($p < 0.05$). For the independent variable, partner diversity ($p < 0.01$) and functional diversity ($p < 0.05$) were significantly related to firm performance, but not governance diversity. The moderator of alliance strategy is not significant at the base model.

Model 4 examined the interaction between partner diversity and alliance strategy, related to hypothesis (H1), indicating a moderating effect of alliance strategy. Model 4 shows that the interaction term was significant at ($p < 0.01$) and coefficient was positive at 0.485. The R^2 change was 0.015, which is significant, and F-statistic was significant at ($p < 0.01$). The results of the control variables are similar to Model 3 except for RD orientation ($p < 0.01$), with an increase in significance level. For independent variables, all three diversities were significantly related to firm performance. Compared to Model 3, partner diversity was at significant level of ($p < 0.05$) instead of ($p < 0.01$), functional diversity was at significant level of ($p < 0.1$) instead of ($p < 0.05$), and governance diversity becomes significant at ($p < 0.1$).

In Model 5, I added the interaction term of functional diversity and alliance strategy. The interaction term was not significant. The R^2 change was 0.005, which is

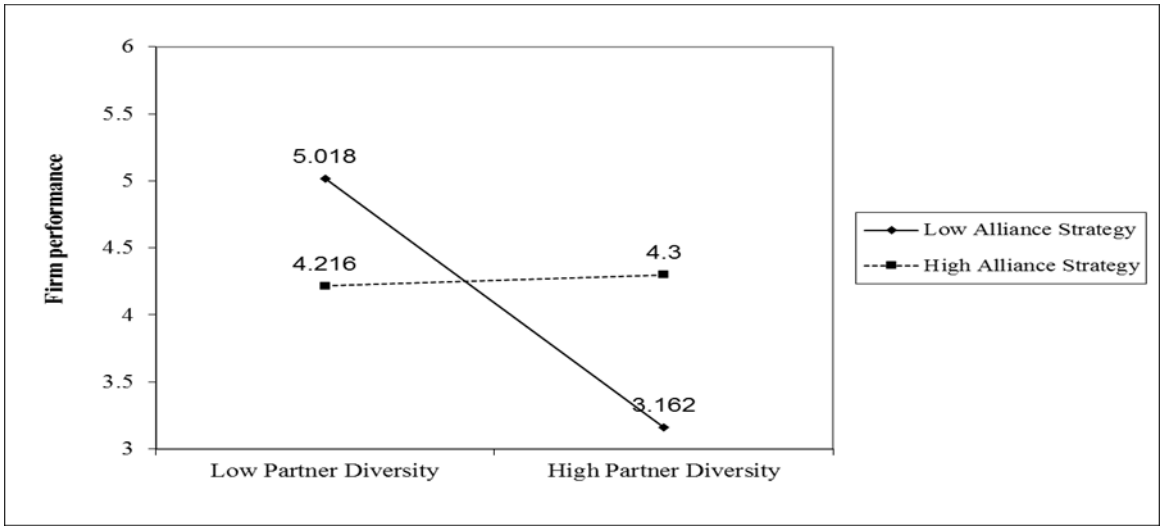
not significant. F-statistics was significant ($p < 0.01$). The results of control variables were the same as Model 3. The results of independent variables were also similar to model 3 except for small p value changes for partner diversity from ($p < 0.01$) to ($p < 0.05$), and functional diversity from ($p < 0.05$) to ($p < 0.1$). Governance diversity was not significant.

In Model 6, I added the interaction term of governance diversity and alliance strategy. The interactions term was not significant. R^2 change was 0.002, which is not significant. F-statistic was statistically significant ($p < 0.01$). The control variables and independent variables had similar results to Model 3 except for age, which had an increase in significance level from ($p < 0.1$) to ($p < 0.05$).

In order to demonstrate whether the nature of significant hypotheses was as specified, a graphical presentation of the interaction term is shown in Figure 3-1. Figure 3-1 illustrates that the moderator of alliance strategy impacts on the relationship between partner diversity and firm performance. More specifically, when partner diversity increases, managers with orientations toward a portfolio strategy result in high performance. In contrast, managers with orientations toward a standalone strategy suffer from low performance; thus, as hypothesis H1 suggested, alliance strategy moderates the relationship between partner diversity and firm performance. Firms with high diversity tend to extract more benefits from an orientation toward

portfolio strategy.

Figure 3 - 1: Interaction effect of alliance strategy between partner diversity and firm performance



3.4.3. Robustness Test

In my sample, 65% of firms had a dedicated alliance function in place. Previous studies suggest that firms investing in a dedicated alliance function can capture prior alliance knowledge and experiences, re-combine with existing know-how and re-use for future alliances. As a result, the dedicated alliance function can enhance a firm's alliance capability and success (Kale et al., 2002, Kale and Singh, 2009, Schreiner et al., 2009, Kale and Singh, 2007). If firms have a dedicated alliance function, they may have more experiences in their alliance operations, and this is likely to impact on firm performance. Kale and Singh (2009) highlight that firms with a dedicated alliance function which manages firms' alliance operations and coordinates their alliance activities enjoy a high alliance success rate of 70% compared to firms without a dedicated function (with a success rate of 40%). However, my data did not show if

firms taking a portfolio strategy are likely to have a dedicated alliance function.

If a dedicated function is so beneficial to firms' alliance activities, can this function explain the conflicting results between alliance diversities and firm performance relationships? The question is: Can firms only have alliance function without alliance strategy? Would alliance function moderate between alliance diversities and firm performance? To address these questions, I conducted further regression analysis to see if alliance function can substitute for alliance strategy. The correlation between alliance strategy and alliance function is 0.256 in my data. These are not closely related. Initially, alliance function was a control variable, and alliance strategy was the moderating variable in the original regression analysis. I conducted this robustness test by substituting alliance function for alliance strategy to see if there is any impact on the relationships between alliance diversities and firm performance.

The first regression model includes the 16 control variables – firm age, firm size, international sales, RD orientation, alliance number, past performance, two industrial effects, country effect and managerial characteristics of age, educational level, major in business, elite education, tenure, output functional background and alliance strategy. The second model adds alliance diversities as the independent variables – partner, functional and governance diversities. The third model includes all the main effects. I included controls, independent variables, and alliance function as the moderating

variable instead of alliance strategy. Firm performance was the dependent variable in the three models.

Models 4, 5 and 6 examine the moderating influence of alliance strategy between alliance diversities and firm performance. For each of these models, I compared the increase in explanatory power to the main effect (Model 3). The results of each model are shown in Table 3-5.

Model 1 includes all control variables only and is significant, with F-statistic of 15.036 at a significant level of ($p < 0.01$). Five control variables were significantly related to firm performance. There were slight changes in significance levels compared to the original regression results in Table 3-4. RD orientation ($p < 0.01$) and past performance ($p < 0.01$) were the same. Age was at significant level of ($p < 0.05$) instead of ($p < 0.1$), major in business ($p < 0.1$) instead of ($p < 0.05$), and output functional background ($p < 0.1$) instead of ($p < 0.05$). Alliance strategy was not significant. The control variables in Model 1 accounted for 58.2% ($p < 0.01$) of variance in firm performance and the original regression R^2 was 58.7% ($p< 0.01$).

In Model 2, I added the independent variables. The three different diversities as independent variables accounted for an increase of significant 2% of the variance in firm performance in R^2 compared to Model 1. F-statistic was significant at ($p < 0.01$). Model 2 shows that the results of control variables were similar to Model 1, except for

some changes in significant level of RD orientation from ($p < 0.01$) to ($p < 0.05$), and output functional background from ($p < 0.1$) to ($p < 0.05$). Major in business is no longer significant. For the independent variables, Model 2 shows that partner diversity ($p < 0.05$) and functional diversity ($p < 0.05$) were significant predictors of firm performance. In the original regression analysis, Model 2 shows that partner diversity was significant at ($p < 0.01$), functional diversity was significant at ($p < 0.05$) and governance diversity was not statistically significant.

Model 3 tested the direct main effects of control variables, independent variables and the moderator – alliance function. The results show a small R^2 change of 0.011 compared to Model 2. F-statistic was significant ($p < 0.01$). Model 3 shows that the five control variables were similar to Model 2, but compared to Model 2 there are some changes in the statistical significance level. The five control variables show that RD orientation and past performance were the same at ($p < 0.05$) and ($p < 0.01$) respectively. Age was significant at ($p < 0.1$) instead of ($p < 0.05$), major in business became significant at ($p < 0.1$), and output functional background was the same at ($p < 0.05$). For the independent variable, partner diversity was significant at ($p < 0.01$) instead of ($p < 0.05$), functional diversity was the same at ($p < 0.05$), and governance diversity was not significant – the same as Model 2. The moderating variable – alliance function – was significant at ($p < 0.05$).

The base model has a similarly significant control and independent variables compared to the original base model in Table 3-4, except for the moderating variable – alliance function – which was significant at ($p < 0.05$), but the moderating variable of alliance strategy was not significant in the original model in Table 3-4.

Model 4 examined the interaction of partner diversity and alliance function. Model 4 shows that the interaction term was not significant. F-statistic was significant at ($p < 0.01$). The results of the control variables were the same as Model 3. For independent variables, partner diversity was significant at ($p < 0.05$) instead of ($p < 0.01$), functional diversity was the same at ($p < 0.05$), and governance diversity was not significant – the same as Model 3. The moderating variable – alliance function – was significant at ($p < 0.05$).

In Model 5, I added the interaction term of functional diversity and alliance function. The interaction term was not significant. The R^2 change was 0.002, which was not significant. F-statistic was significant ($p < 0.01$). The results of the control variables were the same as Model 3. The results of independent variables show only partner diversity was significant at ($p < 0.01$). Both functional diversity and governance diversity were not significant. The moderating variable – alliance function – was significant at ($p < 0.05$).

In Model 6, I added the interaction term of governance diversity and alliance

function. The interaction term was not significant. F-statistic was statistically significant ($p < 0.01$). The control variables and independent variables had similar results to Model 3. The moderating variable – alliance function – was significant at ($p < 0.05$).

The results of original regression analysis and robustness test are summarised and shown in Table 3-6.

This robustness test shows that alliance function cannot substitute for alliance strategy. Alliance function is important in firms' alliance activities and is related to firm performance, but it does not impact on the relationships between alliance diversities and firm performance. Alliance strategy is important for managing alliance diversities. Particularly, when partner diversity changes, executives with different alliance strategies – either standalone or portfolio – will result in different performance outcomes. When partner diversity increases, the adoption of a portfolio strategy by executives results in high performance, and executives adopting standalone strategy suffer from low performance. Therefore, as Hypothesis 1 suggested, alliance strategy moderates the relationship between partner diversity and firm performance, but alliance function does not.

Table 3- 4: Regression results for moderating effects of alliance diversities and alliance strategy on firm performance

Dependent Variable	Firm Performance				Firm Performance				Firm Performance				Firm Performance				Firm Performance				Firm Performance			
	Model 1				Model 2				Model 3 (Main Effect)				Model 4				Model 5				Model 6			
Control Variables	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	0.011		0.013	0.396	0.007		0.013	0.591	0.006		0.013	0.625	0.011		0.013	0.400	0.006		0.013	0.650	0.005		0.013	0.673
Firm size	0.000		0.000	0.831	0.000		0.000	0.850	0.000		0.000	0.786	0.000		0.000	0.968	0.000		0.000	0.713	0.000		0.000	0.893
International sales	-0.006		0.008	0.478	-0.007		0.008	0.340	-0.008		0.008	0.311	-0.008		0.008	0.300	-0.007		0.008	0.345	-0.009		0.008	0.271
RD orientation	0.646	***	0.239	0.008	0.592	**	0.240	0.014	0.583	**	0.240	0.016	0.613	***	0.237	0.010	0.616	**	0.241	0.011	0.603	**	0.241	0.013
Alliance Function	0.719	*	0.414	0.084	0.980	**	0.419	0.021	0.920	**	0.429	0.033	0.952	**	0.422	0.025	0.969	**	0.429	0.025	0.931	**	0.429	0.031
Alliance Number	-0.014		0.011	0.200	-0.014		0.011	0.197	-0.013		0.011	0.222	-0.014		0.011	0.208	-0.014		0.011	0.204	-0.010		0.011	0.380
Past performance	0.643	***	0.055	0.000	0.639	***	0.054	0.000	0.632	***	0.055	0.000	0.631	***	0.054	0.000	0.641	***	0.055	0.000	0.633	***	0.055	0.000
Industry effect 1	-0.122		0.505	0.809	-0.080		0.509	0.875	-0.158		0.523	0.763	-0.086		0.515	0.868	-0.194		0.522	0.710	-0.181		0.524	0.730
Industry effect 2	-0.628		0.505	0.216	-0.726		0.544	0.184	-0.760		0.547	0.167	-0.838		0.539	0.122	-0.786		0.545	0.151	-0.655		0.557	0.242
Country effect	-0.910		0.804	0.260	-0.716		0.796	0.370	-0.730		0.798	0.361	-0.500		0.789	0.528	-0.638		0.797	0.424	-0.766		0.799	0.339
Age	0.403	*	0.229	0.080	0.424	*	0.225	0.062	0.438	*	0.227	0.055	0.393	*	0.224	0.080	0.435	*	0.226	0.056	0.452	**	0.227	0.048
Level of education	-0.037		0.222	0.867	-0.092		0.220	0.676	-0.108		0.222	0.626	-0.110		0.218	0.614	-0.093		0.221	0.677	-0.160		0.228	0.483
Major in business	-0.788	**	0.382	0.041	-0.667	*	0.377	0.079	-0.653	*	0.378	0.086	-0.635	*	0.372	0.090	-0.669	*	0.377	0.078	-0.634	*	0.379	0.096
Elite education	0.322		0.443	0.469	0.319		0.435	0.465	0.324		0.436	0.459	0.374		0.429	0.384	0.327		0.434	0.452	0.382		0.440	0.387
Tenure	-0.277		0.219	0.207	-0.288		0.215	0.183	-0.310		0.218	0.157	-0.247		0.216	0.254	-0.327		0.218	0.135	-0.316		0.218	0.149
Output Functional background	0.809	**	0.401	0.045	0.986	**	0.397	0.014	0.963	**	0.399	0.017	0.937	**	0.392	0.018	0.920	**	0.398	0.022	0.959	**	0.399	0.017
Independent variables																								
Partner Diversity					-0.532	***	0.202	0.009	-0.542	***	0.203	0.008	-0.443	**	0.203	0.031	-0.506	**	0.204	0.014	-0.536	***	0.203	0.009
Functional Diversity					0.416	**	0.208	0.047	0.426	**	0.209	0.043	0.398	*	0.205	0.054	0.364	*	0.212	0.087	0.437	**	0.209	0.038
Governance Diversity					0.265		0.189	0.163	0.260		0.190	0.172	0.339	*	0.189	0.075	0.288		0.190	0.131	0.206		0.197	0.297
Moderator																								
Alliance Strategy									0.134		0.202	0.507	0.084		0.199	0.674	0.098		0.202	0.627	0.106		0.203	0.602
Interactions																								
Partner Diversity X Alliance Strategy													0.485	***	0.185	0.009								
Functional Diversity X Alliance Strategy																	0.301		0.199	0.132				
Governance Diversity X Alliance strategy																					0.176		0.177	0.322
Constant	4.212		1.586	0.009	4.388		1.589	0.006	4.691		1.656	0.005	4.174		1.640	0.012	4.250		1.675	0.012	4.473		1.670	0.008
F statistics (sig)	15.386***				14.082***				13.356***				13.491***				12.926***				12.766***			
F Change					3.529				0.443				6.885				2.290				0.987			
R square	0.587				0.611				0.612				0.628				0.618				0.615			
Adjusted R square	0.549				0.568				0.567				0.581				0.570				0.567			
R square change					0.024				0.001				0.015				0.005				0.002			
VIF Range	1.117-1.977				1.135-2.394				1.139-2.415				1.139-2.422				1.135-2.417				1.152-2.476			
Note: N=190																								
* p < 0.10, ** p < 0.05, *** p < 0.01																								

Table 3- 5: Regression results for substituting alliance strategy for alliance function

Dependent Variable	Firm Performance				Firm Performance				Firm Performance				Firm Performance				Firm Performance				Firm Performance			
	Model 1				Model 2				Model 3 (Main Effect)				Model 4				Model 5				Model 6			
Control Variables	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig	B		SE	Sig
Firm age	.011		.013	.388	.008		.013	.560	.006		.013	.625	.006		.013	.652	.007		.013	.574	.006		.013	.623
Firm size	.000		.000	.903	.000		.000	.937	.000		.000	.786	.000		.000	.792	.000		.000	.761	.000		.000	.799
International sales	-.004		.008	.582	-.005		.008	.486	-.008		.008	.311	-.008		.008	.312	-.008		.008	.320	-.008		.008	.320
RD orientation	.639	***	.241	.009	.573	**	.243	.020	.583	**	.240	.016	.581	**	.241	.017	.584	**	.241	.016	.578	**	.241	.018
Alliance Number	-.009		.011	.378	-.008		.011	.434	-.013		.011	.222	-.013		.011	.228	-.015		.011	.179	-.014		.011	.216
Past performance	.641	***	.056	.000	.638	***	.056	.000	.632	***	.055	.000	.633	***	.055	.000	.633	***	.055	.000	.633	***	.055	.000
Industry effect 1	-.059		.516	.909	-.059		.527	.912	-.158		.523	.763	-.170		.530	.748	-.142		.524	.786	-.136		.528	.797
Industry effect 2	-.663		.512	.197	-.689		.552	.213	-.760		.547	.167	-.752		.551	.174	-.787		.548	.153	-.775		.550	.161
Country effect	-.912		.810	.262	-.779		.806	.335	-.730		.798	.361	-.733		.800	.361	-.751		.798	.348	-.774		.810	.341
Age	.062	**	.031	.048	.066	**	.031	.034	.059	*	.031	.055	.059	*	.031	.055	.060	*	.031	.051	.059	*	.031	.057
Level of education	-.050		.347	.885	-.146		.346	.673	-.167		.343	.626	-.172		.345	.619	-.143		.344	.677	-.173		.344	.616
Major in business	-.687	*	.381	.073	-.538		.378	.157	-.653	*	.378	.086	-.652	*	.379	.087	-.644	*	.378	.091	-.663	*	.380	.083
Elite education	.325		.447	.467	.332		.441	.452	.324		.436	.459	.322		.437	.462	.348		.437	.427	.309		.439	.483
Tenure	-.328		.221	.141	-.351		.220	.112	-.310		.218	.157	-.312		.219	.156	-.333		.219	.131	-.304		.220	.169
Output Functional background	.663	*	.397	.097	.787	**	.394	.048	.963	**	.399	.017	.964	**	.400	.017	.911	**	.403	.025	.959	**	.400	.018
Alliance Strategy	.051		.062	.414	.069		.061	.262	.041		.062	.507	.042		.062	.505	.045		.062	.473	.042		.062	.500
Independent variables																								
Partner Diversity					-2.566	**	1.143	.026	-3.085	***	1.156	.008	-2.969	**	1.368	.031	-3.049	***	1.157	.009	-3.043	***	1.165	.010
Functional Diversity					2.082	**	1.004	.040	2.026	**	.993	.043	2.059	**	1.018	.045	1.078		1.402	.443	2.003	**	.998	.046
Governance Diversity					1.682		1.457	.250	1.988		1.449	.172	1.970		1.458	.178	1.942		1.450	.182	1.519		1.985	.445
Moderator																								
Alliance Function									.920	**	.429	.033	.921	**	.430	.034	.933	**	.429	.031	.918	**	.430	.034
Interactions																								
Partner Diversity X Alliance Function													-.063		.393	.874								
Functional Diversity X Alliance Function																	.347		.362	.339				
Governance Diversity X Alliance Function																					.124		.357	.729
Constant	0.892		2.397	0.710	1.247		2.366	0.599	2.036		2.370	0.392	1.970		2.413	0.415	2.352		2.394	0.327	2.149		2.339	0.372
F statistics (sig)	15.036***				13.530***				13.356***				12.648***				12.758***				12.659***			
F Change					2.884				4.599				0.025				0.919				0.120			
R square	0.582				0.602				0.612				0.613				0.615				0.613			
Adjusted R square	0.543				0.557				0.567				0.564				0.566				0.564			
R square change					0.020				0.011				0.000				0.002				0.000			
VIF Range	1.094-2.009				1.116-2.406				1.139-2.415				1.139-2.433				1.139-2.460				1.144-2.431			
Note: N=190																								
* p < 0.10, ** p < 0.05, *** p < 0.01																								

Table 3- 6:Results comparison between original test and robustness test

	Original Test						Robustness Test					
	Moderating effect-Alliance Strategy						Moderating Effect-Alliance function					
F-statistics (sig)	15.386**	14.082***	13.356***	13.491***	12.926***	12.766***	15.036***	13.530***	13.356***	12.648***	12.758***	12.659***
Adjusted R Square	0.549	0.568	0.567	0.581	0.570	0.567	0.543	0.557	0.567	0.564	0.566	0.564
Hypotheses	Mode 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 1	Model 2	Model 3	Model 4	Model5	Model 6
H1_Partner diversity X Alliance strategy				p < 0.01								
H2_Functional diversity X Alliance strategy					0.132							
H3_Governance diversity X Alliance strategy						0.322						
H1_Partner diversity X Alliance function										0.874		
H2_Functional diversity X Alliance function											0.339	
H3_Governance diversity X Alliance function												0.729
Moderating Variable												
Alliance Strategy			0.507	0.674	0.627	0.602						
Alliance Function									p < 0.05	p < 0.05	p < 0.05	p < 0.05
Significant Controls												
RD Orientation	p < 0.01	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.01	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05
Alliance function/Alliance Strategy	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05						
Past performance	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01
Age	p < 0.1	p < 0.1	p < 0.1	p < 0.1	p < 0.1	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.1	p < 0.1	p < 0.1
Major in busines	p < 0.05	p < 0.1	p < 0.1	p < 0.1	p < 0.1	p < 0.1	p < 0.1		p < 0.1	p < 0.1	p < 0.1	p < 0.1
Output functional background	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.1	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05
Significant Independent Variables												
Partner		p < 0.01	p < 0.01	p < 0.05	p < 0.05	p < 0.01		p < 0.05	p < 0.01	p < 0.05	p < 0.01	p < 0.01
Functional		p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05		p < 0.05	p < 0.05	p < 0.05	0.443	p < 0.05
Governance		0.163	0.172	0.075*	0.131	0.297		0.250	0.172	0.178	0.182	0.445

3.5. Discussion

Although many studies have explored the relationship between diversity and firm performance such as (Goerzen, 2007, Jiang et al., 2010), an area that has not been fully analysed in the literature is the moderating effect of alliance strategy on the relationship between alliance diversity and firm performance. Scholars have noted that strategic alliances are an important source of firms' resources (Barney, 1991) in which access and integration are crucial for the success of firm outcomes. Alliance diversity reflects firm's accessibility to needed resources and alliance strategy facilitates the re-configuration and integration of these resources.

This study provides initial evidence that alliance strategy is important for partner diversity and firm performance. I found empirical evidence to support my analysis that the moderating influence of alliance strategy had a significant impact on partner diversity, and, as a result, on firm performance. Despite the notion of partner diversity providing firms with more opportunities and resources which enable to achieve better firm performance (Jiang et al., 2010). I found that differences in strategic orientation of alliance strategy influenced how opportunities and resources were managed and re-combined, and hence it can result in different performance outcomes. More specifically, The highly statistical significant moderating effect of alliance strategy between partner diversity and firm performance indicates that alliance strategy is important for alliance operations, and the potential benefits of diverse partners require alliance strategy to integrate resources. The implications are clear: firms forming alliances that take a standalone approach to managing their partner diversity tend to have an adverse effect on firm performance compared to firms taking a portfolio alliance strategy.

While prior literature has suggested that firms' operating alliances with either a

focused international alliance network or a diverse network tend to have better performance than those firms that are in between (Goerzen, 2007), other scholars note that high level of diversity in firms' alliances can negatively impact firm performance (Faems et al., 2010, Goerzen, 2007, Koka and Prescott, 2008, Vasudeva and Anand, 2011). My finding provides a different insight to the previous research. Taking a strategic perspective, I find that alliance strategic orientation can help to better understand the relationship between diversity and firm performance.

In contrast, in the two other hypotheses (H2) and (H3), I did not find significant results. For Hypothesis 2 (H2), I hypothesised that alliance strategy moderates the relationship between functional diversity and firm performance. The result did not show such effect statistically. There may be a few reasons why alliance strategy is not a significant moderating influence. First, firms in the PCB and plastic rubber industries appear to be more concerned about who their alliances partners are; whether the collaborations are the same functions or cross functions becomes a secondary consideration. When the decision to form strategic alliances has been made, it does not matter with which functions they form alliances. Firms believe that all different/relevant functions shall be involved. When I asked the diversity questions in the survey, they were hesitant to report the ratio of alliances in each function. Second, senior executives may know in the big picture what each alliance is, but tend to have less idea about what functions are involved. Therefore, these two reasons may give such a result which is different from my expectations.

For Hypothesis 3 (H3), I hypothesised that alliance strategy moderates the relationship between governance diversity and firm performance. In my survey data, 76.8% of the firms had a zero score on the governance diversity index, and this may distort the result, as firms in the two industries tend to use non-equity alliances. They

tend to have alliances with suppliers, customers and manufacturer partners. These partners often have a long-established relationship; normally they do not need to have equity alliances to work together. Also, some respondents said this was considered confidential information, and they tended not give the true answers.

Despite the problem with Hypotheses H2 and H3, in this study, I make two important contributions to the strategic management studies as well as alliance research. The first and unique contribution to the literature is that alliance strategic orientation does influence the relationship between partner diversity and firm performance. Building on strategic perspective, I developed and tested theories to explain how strategic orientation in alliance strategy can achieve better firm performance while they form their alliances. I found that firms with a high level of partner diversity benefit from taking a portfolio strategy because these firms can obtain and integrate resources effectively, resulting in better firm performance. Firms with a high level of partner diversity would not gain benefits from taking a standalone strategy because they tend to lack the ability to integrate synergies, and, as a result, they tend to have sub-optimal firm performance.

The second contribution is that my empirical results help to clarify the conflicting results of alliance diversity on firm performance. I confirm with previous studies that alliance diversities are related to firm performance, namely – partner diversity, functional diversity and governance diversity (Brouthers et al., 2009, Brouthers et al., 2014, De Leeuw et al., 2014, Duysters et al., 2012, Hagedoorn and Schakenraad, 1994, Jiang et al., 2010). In theory, my study provides an important insight that partner diversity as direct effect has a negative coefficient from the regression analysis. This implies that high diversity may not be a good thing but that it can be managed through taking an appropriate alliance strategy.

Limitations

Although this study provides valuable insights about alliance diversity, alliance strategy and firm performance, it suffers from a number of limitations. First, I tested my theories based on two industries from Taiwan and China. I do not know if my finding is generalizable to firms in other industries, or in other countries – especially western countries such as the US and UK. In addition, the sample firms had quite strong experiences on strategic alliances, and so my result may not be generalizable to firms with less strategic alliance experiences.

Second, my sample contains both large and small firms. Future studies may consider to include only large firms or just SMEs to see if they may behave differently to determine if my findings are generalizable to these different sizes of firms.

Third, although common methods variance indicates this is not a problem with my study, future studies could improve on the data collection techniques I used. In my study, only perceptual measures of alliance strategy, past performance and firm performance were used. Perceptual measures may be biased and reflect a desired state rather than an actual scenario (Brouthers et al., 2003). Future research efforts may consider to evaluate secondary data on the collections of firm alliances to validate firm alliance strategy. For past performance and firm performance measures, financial data from secondary sources can be used for triangulation.

Fourth, we collected the data on the tendency of choosing alliance strategy after the choice was made. The responses may be an adjusted perception (Brouthers et al., 2003, Brouthers et al., 2000). Future research may consider a longitudinal study, and, using improved measures, could clarify how alliance strategic orientation was formed, and also the process to formulate its alliance strategy.

Fifth, response bias may be present. One cultural difference is that Chinese

executives – or the Chinese in general – tend to avoid extreme response options, or exaggerate in their answers. Krosnick (1999) suggests that avoiding extreme answers in a survey may present a response bias. Future research may consider to design the questionnaire differently to overcome this issue.

Finally, future research may consider extending the range and measure of the managerial characteristics in the control variables. This may help to identify other personal factors that have an influence on the tendency of alliance strategy. Additional factors may include socio-economic background such as income, cultural/ethnicity and religion, because these factors may influence one's attitudes, beliefs and behaviour.

Implications

My study confirms that alliance strategy is important for alliance operations, especially for firms with a high number of different partners. This is a key implication for senior executives who are in charge of alliance operations. Executives need to understand their own strategic orientations and their firm's alliance composition in order to adopt or adjust for a suitable alliance strategy. Hence, firms can benefit from the choice of alliance strategies to manage firms' alliance diversities and result in better firm performance.

Executives may understand that alliance diversities and firm performance are related, but they may not understand well that different diversities can impact differently on firm performance. Executives need to be aware that not all types of diversities are good. Partner and functional diversities are strongly related to firm performance but not governance diversity. If firms have too many different types of alliance governance structures, such as equity sharing, arm's length deals and joint ventures, it would create high transaction costs. It is imperative that executives have a

clear understanding of firms' alliance diversities so that this can enhance firm performance.

Most importantly, my study suggests that the choice of an alliance strategy plays a significant role for firms' alliance operations, especially for firms with a high partner diversity. Firms with a high partner diversity, managers need take a more holistic view about their alliance operation. Taking a portfolio strategy is likely to result in high performance. However, taking a standalone strategy may not gain benefit from a high partner diversity. Hence, firms have diverse partners, executives need to adjust their own strategic orientation more toward a portfolio strategy. Firms can enjoy the greater benefits from diverse partners in their alliances and result in better firm performance.

Conclusion

In sum, my study makes several important contributions. By exploring the impact of alliance strategy between alliance diversity and firm performance, I add valuable insights about how alliance strategy can be adopted by firms to mitigate the drawbacks of high alliance diversity and improve firm performance. I add to existing knowledge by investigating the moderating effect between alliance diversity and firm performance, noting that alliance strategy can lead to enhanced firm performance for firms with a high partner diversity. Thus, I advance strategic and alliance research by providing valuable suggestions for firms' senior managers.

3.6.References

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IV. DO ALLIANCE STRATEGY AND ALLIANCE CAPABILITY CONTRIBUTE TO FIRM PERFORMANCE?

4.1. Introduction

Strategic alliances have become an important part of firms' competitive and growth strategies, and are an important source of competitive advantage (Ireland et al., 2002, Heimeriks and Duysters, 2007). Strategic alliance is defined as voluntary corporate arrangements between firms that involve the sharing of knowledge, resources and capabilities, with the intent of developing processes, products or services (Gulati, 1998). Firms expand their number of alliances in order to meet their changing strategic needs (Hoffmann, 2007, Parise and Casher, 2003). Studies show that strategic alliances allow firms to access critical resources and capabilities in order to achieve corporate objectives such as entering into new markets, complementary assets for new product development as well as gaining legitimacy (Brouthers et al., 2014, Pisano, 1990, Shan et al., 1994, Baum et al., 2000).

Scholars have shown that alliance performance is very different among firms (Anand and Khanna, 2000, Kale et al., 2002, Heimeriks and Duysters, 2007). Some firms seem to be very effective in alliance operations and are able to use alliances to achieve a better performance, while others seem to suffer from high failure rates that can be detrimental to firm performance (Greve et al., 2010, Park and Ungson, 2001). Superior performance depends on firm strategy and its resource reconfiguration (Miles and Snow, 1984).

In this paper, I suggest that firm performance is contingent on the type of alliance strategy adopted. The way managers organise alliances can differ depending on whether they perceive each alliance independently or all alliances together. A standalone alliance strategy is when firms treat each strategic alliance as a standalone

occurrence. Each alliance has a specific objective which firms intend to achieve from the collaboration. For example, firms form marketing alliances with the objective of entering into a new market; forming such alliances enables firms to overcome resource deficiencies as they can utilise a partner's marketing knowledge and marketing channel resources. The pooling of such marketing resources enables firms to build competitive advantage (Brouthers et al., 2014, Ireland et al., 2002, Nakos and Brouthers, 2008, Nakos et al., 2014, Rothaermel, 2001a, Rothaermel, 2001b).

Alternatively, firms can take into account the strategic implications across the entire set of alliances in their alliance portfolio (Hoffmann, 2005, Hoffmann, 2007, Ozcan and Eisenhardt, 2009). This can be referred to as a portfolio alliance strategy. Scholars have recommended that firms should consider all alliances together to gain synergistic effects and potentially better performance (Cui and O'Connor, 2012, De Leeuw et al., 2014, Duysters et al., 2012, Hoffmann, 2005, Hoffmann, 2007, Jiang et al., 2010, Parise and Casher, 2003, Sarkar et al., 2009, Vassolo et al., 2004). However, these scholars do not compare the performance outcomes of companies that adopt portfolio strategy with companies that adopt standalone strategy. To date, it is unclear whether different alliance strategies will affect firm performance differently.

How well a firm implements its strategy depends on its resources and capabilities (Miles and Snow, 1984). The resource-based view suggests that firm performance is contingent on firm resources (Barney, 1991, Hitt et al., 2000, Ray et al., 2004). Firm resources can be separated into resources and capabilities. Resources can be traded and may not be specific to a firm. Capabilities are embedded and are therefore not easily transferred; they are firm-specific. A firm's capabilities are the special type of firm resources that are required to deploy other firm resources through organisational processes to create a desired outcome (Amit and Schoemaker, 1993,

Makadok, 2001). A firm's capabilities are unique, resource-based advantages that meet the valuable, rare, inimitable and non-substitutable (VRIN) criteria, and bring advantages over competitors, leading to superior performance (Barney, 1991).

Firms' abilities to create and deploy alliance resources and assets may vary. They may create and capture value differently and contribute to firm performance differently (Anand and Khanna, 2000, Gulati, 1998, Kale et al., 2002). Alliances are viewed as a critical strategic option to gain access to partners' resources (Das and Teng, 2000, Park et al., 2004). Alliance capabilities enable firms to better utilise alliance opportunities and resources and manage their alliances better. Scholars have emphasised the importance of alliance capabilities for explaining performance differences among firms (Anand and Khanna, 2000). Particularly, scholars have suggested that alliance capabilities influence alliance success; this appears to have a deterministic effect on firm performance (Anand and Khanna, 2000, Heimeriks and Duysters, 2007, Kale et al., 2002, Kale and Singh, 2009, Lavie et al., 2012, Sampson, 2005, Sarkar et al., 2009, Schilke and Goerzen, 2010, Schreiner et al., 2009, Swaminathan and Moorman, 2009, Zollo et al., 2002). In general, a firm's alliance strategies can define that firm's intentions regarding its alliance operations and objectives. A firm's alliance capabilities determine the effectiveness of the strategies.

Scholars have studied alliance capabilities for individual alliances (Doz, 1996, Dyer and Singh, 1998) and for an entire portfolio of alliances (Heimeriks and Duysters, 2007, Hoffmann, 2007, Sarkar et al., 2009). Kale and Singh (2009), in their Academy of Management Perspective article, distinguish the capabilities necessary to manage alliances as a portfolio from the capabilities to manage single alliances. This distinction is confirmed in an alliance capabilities review article by Wang and Rajagopalan (2015). Alliance capabilities relating to individual or single alliances are

defined as the ability to search, negotiate, manage and terminate an individual alliance (Kale and Singh, 2009, Schreiner et al., 2009, Simonin, 1997, Wang and Rajagopalan, 2015). Alliance capabilities related to a firm's entire set of alliances are defined as the ability to initiate and manage a portfolio of alliances. It focuses on a firm's ability to develop and coordinate all alliances that the firm has (Hoffmann, 2007, Sarkar et al., 2009, Wang and Rajagopalan, 2015).

Some scholars have demonstrated that individual or single alliance capabilities positively influence firm or alliance performance (Anand and Khanna, 2000, Kale et al., 2002, Kale and Singh, 2009, Sampson, 2005, Schreiner et al., 2009, Swaminathan and Moorman, 2009, Zollo et al., 2002), while other studies that used partner-specific experience as a proxy for alliance capability produced mixed results on performance outcomes (Goerzen, 2007, Hoang and Rothaermel, 2005, Zollo et al., 2002). Interestingly, two recent studies have suggested that smaller entrepreneurial firms may not gain positive performance outcomes (Diestre and Rajagopalan, 2012, Katila et al., 2008).

Some scholars have found portfolio alliance capabilities positively affect firm alliance and portfolio performance (Heimeriks and Duysters, 2007, Lavie et al., 2012, Sarkar et al., 2009, Schilke and Goerzen, 2010), but other studies have conceptualised portfolio alliance capabilities, as the number of alliances in a firm's portfolio seems to have different results, such as a positive influence on entering new alliances and an insignificant impact on new product development (Gulati, 1999a, Rothaermel and Deeds, 2006).

Despite the proliferation of studies on alliances and alliance capabilities, there are no studies that link alliance strategy with alliance capability to examine firm performance. The effect of alliance strategy on firm performance and its joint effect

with alliance capabilities on firm performance are not clear from the current literature. I argue that the success of managing a firm's alliances not only relates to a firm's alliance strategy but also to its alliance capabilities. Without alliance capabilities, firms may not be able to fully extract the benefits from their alliances and may be unable to manage their alliance operations well; this will have an impact on firm performance.

More specifically, I propose that individual-alliance capabilities and portfolio-alliance capabilities mediate the relationship between a firm's alliance strategy (i.e. standalone or portfolio) and its performance. A mediator is defined as a variable that explains the relationship between a predictor and an outcome (Baron and Kenny, 1986, Frazier et al., 2004). It is the mechanism through which a predictor influences an outcome variable (Baron and Kenny, 1986). Individual-alliance and portfolio-alliance capabilities have distinctive importance in terms of managing a firm's alliances. Thus, they are likely to have an impact on performance.

If a firm uses a standalone alliance strategy, it may benefit from individual-alliance capabilities. Individual-alliance capabilities relate to a firm's ability to search, negotiate, manage and terminate an alliance. Individual alliances develop at different stages of a firm's alliance life cycle, i.e. formation, design and post-formation (Doz, 1996, Gulati, 1998). Firms possessing these capabilities are able to overcome issues that may arise at each stage of the life cycle. For example, firms need to search for suitable partners and negotiate governance structures and contract terms in order to ensure the success of an alliance. (Brouthers et al., 1995, Dyer and Singh, 1998, Gulati and Singh, 1998, Hitt et al., 2000, Reuer and Arino, 2007). Subsequently, at the post-formation stage, firms need to manage their alliances in terms of coordinating tasks, knowledge and resource sharing, resolving conflicts and sometimes terminating

alliances when required (Doz, 1996, Kale and Singh, 2007, Kale and Singh, 2009, Mohr and Spekman, 1994, Schilke and Goerzen, 2010, Schreiner et al., 2009, Simonin, 1997, Wang and Rajagopalan, 2015). Having individual-alliance capabilities enables firms to better manage their individual alliances so that they may better utilise their specific alliance resources. If a firm can recombine its own resources with those of a partner, these resources can become idiosyncratic resources which are unique to the firm and may lead to a competitive advantage, which may, as a result, contribute to better firm performance.

If a firm uses a portfolio alliance strategy, both levels of alliance capabilities are important because, in addition to the benefits of individual-alliance capabilities, firms need to coordinate among alliances. Two important alliance portfolio capabilities at portfolio level have been identified as partnering proactiveness (Sarkar et al., 2009) and portfolio coordination (Schilke and Goerzen, 2010). Partnering proactiveness is related to the ability to initiate and manage a portfolio of alliances; this is a crucial capability for achieving a valuable and optimal alliance portfolio combination (Heimeriks and Duysters, 2007, Hoffmann, 2005, Hoffmann, 2007, Lavie et al., 2012, Ozcan and Eisenhardt, 2009, Sarkar et al., 2009, Schilke and Goerzen, 2010). Portfolio coordination is related to the ability to coordinate among synergistic or conflicting alliances; this enables a firm to better allocate its limited resources and extract synergistic effects, hence it is likely to increase the success of an alliance portfolio (Hoffmann, 2005, Hoffmann, 2007, Schilke and Goerzen, 2010). The key distinction between the two levels of alliance capabilities is that at the portfolio level, coordination among alliances is an important capability that enables firms to better manage their alliance resource pool. This is likely to enhance a firm's competitive advantages (Ireland et al., 2002), hence it may lead to better performance.

In sum, I hypothesise that the relationship between alliance strategy and firm performance is mediated by the presence of alliance capabilities. I suggest that standalone strategy leads to individual alliance capabilities, which then lead to a better performance. I also suggest that portfolio strategy leads to both individual and portfolio alliance capabilities, which then lead to a better performance. Firms choosing standalone strategy, if they possess individual alliance capabilities, are likely to perform better than firms without the capabilities. In firms adopting portfolio strategy, if they have both individual and portfolio alliance capabilities, they are likely to perform better than firms without both capabilities. This is because these firms have the key firm-specific capabilities which meet the Value, Rarity, Imitability, Organisation (VRIO) principles of the resource-based view.

Firms that taking a portfolio strategy, both levels of alliance capabilities are important because firms not only need to manage each individual alliance but also the entire portfolio of alliances. Individual-alliance capabilities (i.e. abilities to search, negotiate and terminate an alliance) enable firms to manage through the life cycle of each individual alliances. Portfolio-alliance capabilities enable firms to establish an optimal combination of alliances and coordinate among these alliances (i.e. partnering proactiveness and portfolio coordination). Hence, both levels of alliance capabilities help firms to implement a portfolio alliance strategy. In contrast, Firms that taking a standalone strategy, individual-alliance capabilities are important because these capabilities enable firms to better manage their individual alliances by selecting suitable partners, negotiating appropriate governance structure and overcoming issues related each individual alliance. Hence, the individual-alliance capabilities help to implement standalone strategy.

Furthermore, a firm's chosen alliance strategy aligns with its alliance capabilities. This is likely to lead to a positive impact on firm performance. For example, when firms use standalone strategies but only possess portfolio alliance capabilities, this may not lead to a better firm performance. Standalone strategy does not coordinate among alliances, and each alliance is formed on an individual basis. The portfolio alliance capabilities coordinate among alliances and create synergies among alliances. If firms adopt a standalone strategy, the portfolio alliance capabilities will be redundant and of no benefit to the firm. This may result little or no effect on firm performance.

Alternatively, when firms use portfolio strategies, they only possess individual alliance capabilities. This may lead to some performance impact, but it will not be as significant as firms that possess both individual and portfolio alliance capabilities. This is because a portfolio of alliances consists of many individual alliances. When firms adopt portfolio strategies, they need to manage individual alliances as well as the entire portfolio and both levels of alliance capabilities are required. These firms are likely to perform better than those only possessing a single level of alliance capabilities and those without both levels of capabilities, because they are not only aligning alliance capabilities with alliance strategy but also applying the portfolio capabilities to benefit from the synergistic effects of different alliances.

This research makes two important contributions. Firstly, I contribute to alliance capability theory and alliance literature by developing and testing alliance capabilities as a mediator between firm alliance strategy (standalone and portfolio) and performance. Prior studies discuss alliance capabilities and examine these as an important variable in determining alliance success (e.g. Anand and Khanna, 2000, Kale and Singh, 2009, Heimeriks and Duysters, 2007). These studies have shown that

alliance capabilities impact performance and alliance outcomes because alliance capabilities influence a firm's ability to create and capture value. Other studies have shown that the alliance capabilities and performance relationship tended to be moderated by alliance experience or a structural element of a firm's dedicated alliance function (e.g. Rothaermel and Deeds, 2006). Scholars also have found that firm size and market dynamism moderate the effects of alliance capabilities on financial performance (e.g. Sarkar et al., 2009, Schilke, 2014). A previous study suggested that alliance capabilities act as a mediator between experience and alliance performance (e.g. Heimeriks and Duysters, 2007). It is still not clear how alliance capabilities contribute to firm performance. According to the resource-based view, differences in performance between firms can be explained by the unique resource pool. If firms do not have alliance capabilities in their resource pool, they lack the important capabilities to implement their alliance strategy. This is likely to have an impact on firm performance and implies that different alliance strategies can lead to the development of required alliance capabilities, which then leads to better or worse firm performance. This differs from previous studies. In my study, alliance capabilities are investigated as mediators that enhance firms' alliance strategy. As a result, this leads to better firm performance. Hence, this is an important contribution to the strategy and alliance capabilities literature.

My second contribution is that I identified different alliance strategies will require different sets of alliance capabilities to achieve better firm performance. I specified that a standalone strategy requires individual-alliance capabilities and a portfolio strategy requires both individual-alliance capabilities and portfolio-alliance capabilities because the two strategies operate alliance operations differently. This is important because firms can assess if they possess an appropriate level of alliance

capabilities to implement their chosen strategy. In doing so, the required level of alliance capabilities can be acquired in line with firms' alliance strategies. Scholars recognise that the ability to capture value is likely to differ with different alliance strategies, i.e. standalone vs. portfolio (Lavie, 2007). However, I have not seen any studies that bring the alliance strategy and alliance capabilities together; rather, previous studies tended to investigate the standalone and the portfolio strategy separately, or simply did not distinguish the differences between the two (Hoffmann, 2007, Ozcan and Eisenhardt, 2009). Scholars also tend to address different levels of alliance capabilities separately (Sarkar et al., 2009, Schilke and Goerzen, 2010). My research clearly distinguishes between the two different levels of alliance capabilities and how they benefit and help to implement different alliance strategies. I address how alliance strategies lead to alliance capabilities and the effect of alliance capabilities leads to better or worse firm performance. I argue that different levels of alliance capabilities are likely to contribute to performance differently, and that firms that align their alliance strategy with the correct levels of alliance capabilities are likely to have better performance. Otherwise, performance may be suboptimal.

In the following section, I discuss the literature and hypotheses underlying my analysis, and illustrate the theoretical model of firms' alliance strategy and the impact of alliance capability between alliance strategy and firm performance. I will then discuss the research design before presenting my empirical results. The final section concludes by discussing the managerial and theoretical implications of this research.

4.2. Theory and Hypotheses

Firms enter alliances in order to overcome resource deficiencies and extend their competitive advantage (Ireland et al., 2002). The resource-based view suggests that firms with valuable unique resources can gain competitive advantage (Barney, 1991, Peteraf, 1993). Strategic alliances allow firms to obtain external resources through interorganisational partnership (Lin et al., 2009). Through alliances, firms can strengthen their competitive advantage by recombining and reconfiguring resources and capabilities obtained from their alliance partners. Thus, alliances enable firms to develop unique resource bundles that can contribute to firm performance.

The way firms manage alliance resources may differ based on the firm's alliance strategy. Previous studies suggest that viewing alliances as a series of standalone operations or as a portfolio of interconnected projects may have different resource implications (Parise and Casher, 2003, Ozcan and Eisenhardt, 2009). According to the resource-based view, different resources may influence performance differently (Barney, 1991). There is no study that investigates the performance implications of adopting different alliance strategies. We do not know how different the impact on performance may be when firms adopt either a standalone alliance strategy or a portfolio alliance strategy. I argue that adopting a portfolio alliance strategy is more likely to generate superior performance than adopting a standalone alliance strategy.

The resource-based view further suggests that firms need capabilities to manage their resources (Peteraf, 1993). According to Barney (1991), valuable and rare resources provide the basis for value creation. Value is more sustainable when such resources are also inimitable and non-substitutable. However, merely possessing unique resources does not guarantee the development of competitive advantages or the creation of value (Priem and Butler, 2001). In order to realise value creation, firms

must accumulate, combine and exploit resources (Grant, 1991, Sirmon and Hitt, 2003). Scholars have argued that firms need certain capabilities for alliance management (Kale and Singh, 2009, Lavie et al., 2007, Sarkar et al., 2009). For example, Rothaermel and Deeds (2006) suggest that upstream alliances require the largest amount of high-technology venture's alliance management capability, downstream alliances demand the least amount and horizontal alliances a moderate amount. Alliance capabilities influence how firms can create value from strategic alliances and how they differ between firms (Anand and Khanna, 2000).

Alliance capability has been studied from different angles. Ireland et al. (2002) describe alliance capability as the ability to select partners, manage resources and build a long-term relationship with partners. Hoang and Rothaermel (2005) use prior alliance experience to study alliance capability. Heimeriks and Duysters (2007) and Kale and Singh (2007) note that alliance capabilities are firms' ability to capture, learn and reconfigure knowledge and resources obtained from strategic alliances, and, sometimes, re-use in ongoing and future alliances. The authors suggest that alliance capabilities are developed through alliance functions, for example, a dedicated alliance department in charge of all matters relating to alliance operation, as well as through various alliance procedures and guidelines such as those relating to partner evaluation or contract writing. Sarkar et al. (2009) refer to alliance capabilities as process capabilities, or, the ability to manage alliance activities relating to alliance formation, relationship management and coordination of knowledge flows between partners.

From a resource-based perspective, differences in alliance capabilities across firms can explain differences in firm performance (Sarkar et al., 2009). Overall, scholars tend to agree that the greater the alliance capabilities the better the alliance performance and firm performance (Schilke and Goerzen, 2010, Sarkar et al., 2009,

Kale and Singh, 2009). However, studies on alliance capabilities do not compare the impact of different kinds of alliance capabilities on performance. There is little understanding on whether different capabilities, in particular, capabilities related to managing alliances as a portfolio and those related to managing alliances as independent projects – will influence performance differently. Anand and Khanna (2000) clearly establish the existence of differences in 'alliance capabilities' across firms, and suggest that more work is needed to explore the organisational determinants of alliance capabilities. This paper attempts to address this gap by looking at the relationship between a firm's alliance strategy, alliance capabilities and firm performance. I argue that firms with a standalone strategy need to develop capabilities that allow them to manage each individual alliance successfully. For example, alliance formation, design and post-formation (Gulati and Singh, 1998, Kale and Singh, 2009, Wang and Rajagopalan, 2015) are examples of capabilities that are related to managing single alliances. In addition, firms with a portfolio strategy need to know how to configure their collections of alliances (Hoffmann, 2007) and coordinate among alliances (Sarkar et al., 2009). I argue that the extent to which firms have the right capabilities to implement their alliance strategy will determine firm performance.

4.2.1. Alliance Strategy

Alliance strategy refers to the strategy that firms adopt to establish and manage their alliances. Managers may choose a standalone or portfolio strategy for managing multiple alliances. Prior studies on alliance have either studied single alliance or alliance as a portfolio, but not the two together (Brouthers et al., 2014, Ireland et al., 2002, Nakos and Brouthers, 2008, Nakos et al., 2014, Rothaermel, 2001a, Rothaermel, 2001b, Hoffmann, 2007, Parise and Casher, 2003, Wassmer, 2010). There is no empirical research that distinguishes how a firms' tendency to adopt one of these two

alliance strategies may affect firm performance. Through their descriptions of a portfolio approach to managing alliances, scholars have implied that a portfolio approach is likely to bring better performance results than a standalone approach (Ozcan and Eisenhardt, 2009, Hoffmann, 2007, Parise and Casher, 2003, Wassmer, 2010).

With a standalone strategy, firms consider each single alliance as a standalone occurrence and each alliance is managed independently. Standalone strategy enables firms to access heterogeneous resources from its alliance partners. However, resources obtained from different alliances may not be integrated, because managers with a standalone strategy do not view the overall effects of all alliances together. When managers opt for standalone strategy, inefficient or redundant configurations may develop (Vassolo et al., 2004). Firms adopting a standalone strategy may not re-configure or re-combine similar resources found in different alliances. This may prevent them from realising the possible synergistic effects of different alliances (Cui and O'Connor, 2012). Furthermore, considering one alliance at a time can create conflicts to overall corporate strategy (Parise and Casher, 2003, Hoffmann, 2007).

With a portfolio strategy, firms take a holistic view of their alliances to achieve overall corporate objectives (Hoffmann, 2007). Scholars suggest that firms managing their alliances as a portfolio can better utilise synergistic effects between alliances as well as manage risk and uncertainty (Hoffmann, 2007, Parise and Casher, 2003, Hoffmann, 2005, Vassolo et al., 2004, Vapola et al., 2010). Firms often have multiple alliances to achieve multiple goals. A portfolio strategy enables them to simultaneously achieve multiple goals with better coordination and effectively resolve conflicts so that greater overall benefits are obtained (George et al., 2001, Hoffmann, 2007). Managers need to understand the impact that alliances have on each other and

the coordination of resources among them.

Scholars believe that firms can improve performance when they optimise the combination of alliances as a whole (Cui and O'Connor, 2012, De Leeuw et al., 2014, Duysters et al., 2012, Hoffmann, 2005, Jiang et al., 2010, Parise and Casher, 2003, Sarkar et al., 2009, Vassolo et al., 2004). A portfolio strategy is more likely to positively impact performance compared to a standalone strategy for a number of reasons. Firstly, when firms form their alliances independently from each other, they will only consider one alliance at a time. Each alliance would only focus on achieving its own objective rather than on coordinating the goals of independent alliances (Goerzen and Beamish, 2005). It is also possible that redundant and competing alliances may be formed (Ahuja, 2000a, Baum et al., 2000, Schilling and Phelps, 2007). For example, the product manager within a firm may enter an alliance for product development; at the same time, the marketing manager of the same firm may also enter into an alliance for another product development. Redundancy in alliance projects and resource wastage may occur because the two managers would not communicate about their respective alliance when the firm is adopting a standalone alliance strategy. This is likely to waste firm resources and be detrimental to firm performance. A portfolio alliance strategy allows the optimisation of alliance combinations and better coordination among alliances (Hoffmann, 2007, Parise and Casher, 2003, Ozcan and Eisenhardt, 2009). This enables firms to minimise redundant alliances.

Secondly, conflicts are likely to arise between alliances (Arikan and Shenkar, 2013, Li et al., 2008). For example, a firm can simultaneously operate two marketing alliances; one can be for new market development, and another can be for launching a new product into an existing market. Both of these alliances may require the focal firm to provide marketing resources. When these marketing resources are limited,

alliances will compete for them and conflicts may occur as a result (Amaldoss et al., 2000). A standalone strategy does not encourage a conscious effort to minimise the conflict caused by resource competition amongst alliances. As each alliance is formed and operated independently from one another in a standalone strategy, there is no effort to reduce the number of alliances that require similar resources. A standalone strategy allows multiple alliances with similar resource requirements to exist. Therefore, inter-alliance competition for resources is more likely to occur. In contrast, a portfolio strategy allows firms to minimise conflicts among alliances because managers are encouraged to think about how different alliances fit into the overall portfolio (Hoffmann, 2007).

Thirdly, alliances can create opportunities for learning (Doz, 1996). I argue that a portfolio strategy encourages firms to leverage learning opportunities across alliances and within alliances, while a standalone strategy only encourages learning within alliances. Although alliance resources can be potentially internalised and utilised for other alliances, when a firm adopts a standalone strategy, managers are only focused on the current alliance and may not develop management mechanisms within the firm to deploy these resources to other alliances. In contrast, firms adopting a portfolio strategy are likely to internalise and reconfigure the complementary resources for other alliances to use, because a portfolio strategy encourages firms to consider the interrelationship between different alliances. In particular, firms adopting a portfolio strategy may establish a central alliance function (Heimeriks, 2010, Ireland et al., 2002, Kale et al., 2001, Kale et al., 2002, Kale and Singh, 2007, Kale and Singh, 2009), which manages and controls all the alliance related matters such as knowledge and resource management (Heimeriks and Duysters, 2007). Through this centralised function, knowledge would be more easily shared and re-used. A portfolio strategy

may encourage a firm to establish common guidelines and best practice for alliance management (Heimeriks et al., 2009). By learning from previous alliances and developing guidelines and best practice, the firm will be able to reap more benefits from unified alliance management and thereby enhance firm performance.

Fourthly, firms are more likely to create additional resources if there is a conscious effort to develop synergy between different alliances (Vassolo et al., 2004). A standalone strategy would not encourage developing synergy among alliances. It is likely that each alliance only aims to achieve its set goals. There would be no other objective beyond the alliance objective. A portfolio strategy encourages inter-firm learning in order to create synergies between alliances (Hoang and Rothaermel, 2005, Parise and Casher, 2003). Each alliance within the portfolio would be able to access complementary resources from other alliances (Baum et al., 2000, Silverman and Baum, 2002), and managers would be more likely to create idiosyncratic resources from different partners. For example, Research and Development (R&D) technological resources can often be shared and adapted into different R&D projects. A portfolio strategy enables managers to evaluate firms' existing R&D resource stocks from different alliances and find ways to reconfigure them into new R&D projects. This is likely to save on R&D development costs and improve firm performance.

Therefore, firms that follow a standalone strategy and firms that follow a portfolio alliance strategy manage alliance resources differently. Compared to a standalone alliance strategy, a portfolio alliance strategy allows firms to create additional resources because the portfolio strategy will consider potential synergies between alliances. Therefore, I hypothesise that:

> **Hypothesis 1 (H1)**: A portfolio strategy is likely to lead to better firm performance than a standalone strategy.

4.2.2. Alliance Capabilities

Alliances often fail (Kale et al., 2001, Park and Ungson, 2001), even if each partner contributes resources and competencies. This can be due to a lack of alliance capabilities to reconfigure and manage the resources that the focal firm and its partners contribute to achieve the alliance objective (Kale and Singh, 2009). When a firm does not have suitable capabilities to manage its resources, it may not be able to create value from these resources, and firm performance may be affected. This implies that the relationship between alliance strategy and firm performance is also contingent on the capabilities the firm possesses. The firm requires certain capabilities to better manage this mix of resources and competencies.

A number of studies discuss structural and procedural dimensions of alliance capabilities and how they impact performance. For example, the link between alliance capability and performance has long been recognised in the literature. These studies note that firms with alliance functions (e.g. a dedicated alliance department which is in charge of all matters relating to alliance operation), procedures and different alliance tools (e.g. partner evaluation procedures, guidelines) tend to have a better performance than those without (Heimeriks and Duysters, 2007, Kale et al., 2002, Kale and Singh, 2007). Cui and O'Connor (2012) demonstrate that the presence of a dedicated alliance management function positively interacts with portfolio resource diversity to affect firm innovation.

Scholars have also studied how management and process dimensions of alliance capabilities relate to performance. Kale et al. (2002) suggest that firms that invest in a capability at managing alliances are able to enhance the probability of success – both in the short term (generating a positive stock response) and in the long term (meeting the alliance objectives). Sarkar et al. (2009) found that partnering proactiveness,

relational governance and portfolio coordination enhances the overall value of a firm's alliance portfolio. This is reflected in the positive and significant relationship between alliance portfolio capital and firm performance. Schilke and Goerzen (2010) show a significant and positive relationship between alliance management capability and alliance portfolio performance. Schreiner et al. (2009) show that alliance management capability is positively related to firm performance. Simonin (1997) found that the greater the capabilities in partner search, negotiation, management and exiting, the higher the levels of tangible and intangible benefits obtained from a collaboration.

Finally, there is a large number of studies that investigate alliance capabilities from a learning perspective. Accumulated alliance experiences and learning help to improve firm performance (Anand and Khanna, 2000, Deeds and Hill, 1996, Hoang and Rothaermel, 2005, Powell et al., 1996, Zollo et al., 2002). Gulati et al. (2009) demonstrate that partner-specific experience improves alliance performance and that it is important for building relational capabilities (Dyer and Singh, 1998, Gulati and Sytch, 2007). However, some scholars find that partner-specific experience can have a negative impact on joint project success and may decrease alliance performance (Hoang and Rothaermel, 2005).

Overall, scholars tend to agree that the greater the alliance capabilities the better the alliance and the firm performance. However, we know little about whether different strategies require different capabilities and the extent to which different strategies and capabilities can impact on performance. Managing a portfolio of alliances is not the same as managing individual alliances (Kale and Singh, 2009, Schreiner et al., 2009). Furthermore, Wang and Rajagopalan (2015) argue that individual-alliance capability differs from portfolio-alliance capability. Individual-alliance capability is needed to manage individual alliances. It helps managers to

develop skills in managing the life cycle of an alliance. Portfolio-alliance capability helps managers to develop skills in managing a holistic set of alliances (Heimeriks and Duysters, 2007). I suggest that firms use different strategies to manage their alliances. Firms following a standalone alliance strategy are likely to benefit from individual-alliance capabilities. Firms following a portfolio alliance strategy are likely to benefit from both individual-alliance and portfolio-alliance capabilities.

4.2.2.1. Individual-alliance Capabilities

Previous research provides a broad debate about the capability that a firm potentially requires to succeed in any individual alliance. Simonin (1997) suggests that a firm's collaborative know-how of partner search, negotiation, management and termination are the relevant capabilities for managing an individual alliance. The author specifically explains collaborative know-how in terms of a single alliance with a beginning and an end. For example, before a firm enters into an alliance, it needs to identify and capture partnership opportunities then negotiate the terms of the agreement. Once an alliance is formed, the firm needs to monitor and manage resources and tasks between partners. When the alliance has fulfilled its objective, the firm needs to know how and when to terminate the alliance. Schreiner et al. (2009) suggest that coordination, communication and bonding are key capabilities in managing a given alliance, particularly relevant to the post-formation stage of an alliance.

In my study, individual-alliance capabilities are essential skills to effectively manage different phases in the life cycle of any individual alliance (Gulati, 1998). An individual alliance consists of the formation phase, the design phase and the post-formation phase (Doz, 1996, Schreiner et al., 2009). Firms need suitable capability to effectively manage each phase of an alliance. At formation phase, researchers suggest

that a firm's success in any individual alliance depends upon having a suitable alliance partner (Gulati, 1999a, Hitt et al., 2000, Sarkar et al., 2001a). Scholars have shown the importance of partner selection and highlighted that different criteria may be involved when choosing an alliance partner (Hitt et al., 2000, Shah and Swaminathan, 2008). The ability to select a suitable partner is an important capability to have when forming an alliance, because it can affect the resource mix of the alliance and the compatibility of the partners. This capability can influence the short-term and long-term viability of the alliance (Simonin, 1997) depending on how well a firm accurately evaluates its potential partners.

In addition, Shah and Swaminathan (2008) show that partner characteristics can influence alliance performance. They suggest that complementarity, commitment and compatibility are important for the success of the alliance. For example, if a partner provides complementary resources and capability, but the managerial style and culture are different from the focal firm, then this can create conflict. If the partner is lacking commitment to the alliance, then this can potentially cause the alliance to fail. According to Shah and Swaminathan (2008) and Kale and Singh (2009), managers must have the ability to identify firms that are compatible working partners, have sufficient willingness to commit needed resources to the alliance, and bring resource complementarity to the focal firm. This implies that firm needs the capability to proactively seek appropriate alliance partners in order to ensure greater alliance success.

A number of scholars have discussed the importance of finding the right partner as an essential alliance management capability and use different terms such as partner searching (Simonin, 1997), alliance scanning (Kandemir et al., 2006), and alliance proactiveness (Sarkar et al., 2009, Schilke and Goerzen, 2010). In this study, I will

follow Sarkar et al. (2009) and Schilke and Goerzen (2010) to name the capability to search for the right partner as alliance proactiveness. I identify this capability as individual-alliance capability because the firm needs to proactively search alliance partners for each individual alliance to meet the firm's overall objectives.

At design and post-formation phases, scholars have highlighted that for a firm to succeed in any given alliance, it needs to design or choose an appropriate alliance structure and contractual terms (Gulati and Singh, 1998, Oxley, 1997, Reuer and Arino, 2007). In particular, alliance transformation is the capability to adapt an alliance agreement according to unforeseen circumstances (Schilke and Goerzen, 2010). For example, the negotiation of how to share the research outcome occurs at the beginning as part of alliance formation. However, R&D by nature has uncertain research outcomes. Firms need to have the ability to evaluate the sharing of R&D outcome in flexible ways and renegotiate the terms of the alliance agreement. The changes in a firm's environment can also cause contractual agreements to become obsolete. A firm may have manufacturing partners that help the firm in its manufacturing process. The firm may need to transform the manufacturing partnership due to changing market demand for new product lines. The firm must be able to gauge how and when to transform the alliance in order to prevent the loss of market opportunities. I identify Schilke and Goerzen (2010)'s alliance transformation as an individual-alliance capability, through which firms anticipate and prepare for the changes occurring within each individual alliance.

Another essential individual-alliance capability is interorganisational learning. Scholars suggest that the success of an individual alliance rests on how a firm manages an alliance after formation, in particular, sharing knowledge, and utilising and integrating know-how and information (Anand and Khanna, 2000, Deeds and Hill,

1996, Hoang and Rothaermel, 2005, Powell et al., 1996, Zollo et al., 2002). I identify this capability as individual-alliance capability because knowledge, know-how and valuable information are derived from individual alliances. Managing an ongoing alliance requires the capability to transfer resources and knowledge (Simonin, 1997). Without the capability to absorb new knowledge from partners and integrate it within its existing knowledge repository, this can significantly affect the success or failure of an alliance. As a result, a firm may not be able to advance in developing innovations and may also impact on firm performance.

Based on the resource-based view, companies need the right capability for their strategies. A standalone strategy is focused on individual alliances and requires individual-alliance capabilities for firms to manage throughout the life cycle of an alliance. Without individual-alliance capabilities, a firm's individual alliances may be less successful and firm performance may suffer as a result. Therefore, I propose that a firm's individual-alliance capabilities may mediate the relationship between standalone alliance strategy and firm performance. Similarly, with a portfolio strategy, firms are more likely to succeed if they possess individual-alliance capability, because they need to build their collection of alliances. Individual-alliances capabilities can assist in managing each individual alliance within their overall portfolio. Therefore, I hypothesise that the firm's individual-alliance capability may also mediate the relationship between a portfolio alliance strategy and firm performance. The hypothesis is as follows:

> **Hypothesis 2 (H2)**: Individual-alliance capability mediates the relationship between alliance strategy (whether a standalone strategy or a portfolio strategy) and firm performance.

4.2.2.2. Portfolio-alliance Capabilities

Portfolio-alliance capabilities refer to a firm's ability to initiate and manage a portfolio of alliances (Heimeriks and Duysters, 2007, Wang and Rajagopalan, 2015). Based on this broad definition, previous research outlines capabilities necessary to manage each alliance within the portfolio as well as the entire portfolio itself. In other words, they do not tease out capabilities that are specific to a portfolio strategy from those that form the basis of alliance management in general. For the purpose of my study, I adopt a narrower definition of portfolio-alliance capabilities. I refer to portfolio-alliance capabilities as firm's capability to manage the relationships between alliances. I consider the ability to manage each alliance within a portfolio as individual-alliance capabilities.

An important portfolio-alliance capability is inter-organisational coordination, because it is concerned with coordinating activities with alliance partners within a portfolio, synchronising the work with alliance partners. Firms need to have the ability to manage tasks, interdependence and operational processes between partners (Schilke, 2014, Schreiner et al., 2009). Inter-organisational coordination takes into account the interaction and activities among the focal firm and alliance partners. It requires managers to have long-term and holistic strategic thinking in relation to firms' strategic direction. For example, a firm may need to set up a number of explorative or exploitative alliances (Lavie and Rosenkopf, 2006, March, 1991) to develop a complete value chain. For explorative alliances, firms often engage with R&D partners to develop innovative technologies. These partners tend to be from upstream of the value chain. For exploitative alliances, firms often engage alliances for commercialising new products. These partners tend to be from downstream of the value chain. The ability to coordinate the activities of partners from different stages of

value chain and link them together forming a value chain is important for the implementation of a portfolio alliance strategy.

Another essential portfolio-alliance capability is alliance portfolio coordination (Kandemir et al., 2006, Sarkar et al., 2009, Schilke and Goerzen, 2010). Alliance portfolio coordination is the ability to integrate and synchronise activities, knowledge and resources across alliances in a portfolio (Rothaermel and Deeds, 2006, Sarkar et al., 2009, Schilke, 2014, Schilke and Goerzen, 2010). Alliance portfolio coordination is an important capability for firms wishing to pursue a portfolio alliance strategy because it emphasises resource coordination between alliances, which enables firms to better utilise partners' resources. More specifically, alliance portfolio coordination emphasises synergy creation and interdependency management in order to achieve a firm's overall objective and minimize conflicts. Although each alliance may have a different purpose such as new product developments, marketing channel alliances or logistic distribution alliances, they are all part of the overall strategic objective of the alliance portfolio.

Through alliance portfolio coordination, alliances become integrated and resources can be reconfigured into collective assets (Sarkar et al., 2009). Engaging in portfolio coordination allows firms to leverage resources across different partners as well as across the entire portfolio (Gomes-Casseres, 1996). For example, a firm may enter into an alliance with partner A to develop new technology A1, and partner B to develop new technology B1. It is possible that in the course of developing the respective technologies, these alliances may make new additional discoveries that can be combined to develop a new technology C1. In this case, alliance portfolio coordination capabilities would bring A1 and B1 together to further develop technology C1 and enhance the probability of the additional discoveries to be

leveraged by the company. Another example is that a firm may form an alliance with partner A to develop market A and partner B to develop market B. It is possible that different markets would have different demands and requirements. Firms with alliance portfolio coordination capabilities would share market knowledge obtained from market A and market B with other marketing alliances in the portfolio. Firms can recombine different market knowledge as input to new product development and are more likely to better serve other new target markets as well. Through portfolio coordination, firms are able to recombine new discoveries and accumulated knowledge obtained from partners into new market opportunities or even new product innovations. In doing so, they can create greater value for the firm as well as for the alliance portfolio (Parise and Casher, 2003). In addition, alliance portfolio coordination capabilities are likely to enhance partnership relations as well as increase the competitiveness of the overall network of alliances.

Firms engaging in multiple alliances simultaneously and managing them as a portfolio will require portfolio-alliance capabilities in addition to the individual-alliance capabilities. A portfolio strategy takes account of strategic implications across all alliances of the firm. Portfolio-alliance capabilities such as inter-organisational coordination and alliance portfolio coordination can assist in the implementation of portfolio alliance strategy. Therefore, I expect portfolio-alliance capabilities to mediate a firm's portfolio alliance strategy and firm performance.

> **Hypothesis 3 (H3)**: Portfolio-alliance capability mediates the relationship between portfolio strategy and firm performance.

4.3. Methods

4.3.1. Sample

In order to test my hypotheses, I have chosen a sample of Chinese and Taiwanese companies from the printed circuit board (PCB) industry and rubber plastic industry. Industrial statistics show that global PCB output in 2014 was US$60.15 billion (WECC, 2015). PCB firms' output in China and Taiwan are ranked first and third in worldwide output and represent 58.9% of total PCB global output (WECC, 2015). The outputs of China and Taiwan are 44.9% and 14% of global output, respectively. For the plastic rubber industry, China is ranked the largest producer and account for 26% of global of plastic materials (PlasticsEurope, 2015). These two industries are suitable for my study not only because they are relatively large industries, but also PCB firms often enter into partnership and strategic alliances as a way to provide unique business solutions for the changing market environment (Lucintel, 2015) while firms in the plastic rubber industry often establish strategic alliances to enter into new markets or secure raw materials (Sweeney, 2015) .

Given that companies in the two industries are actively forming strategic alliances as common practices, they provide an appropriate research setting to investigate the impact of alliance strategy on firm performance and the impact of alliance capabilities join with alliance strategy on firm performance. More specifically, to understand if alliance capabilities play a mediating role between alliance strategy and firm performance.

The sample consists of manufacturing and contract manufacturer, equipment and machinery providers, raw materials, chemicals and accessories providers and others in the two industries.

4.3.2. Survey

Data were collected through a survey instrument. The survey was prepared through a back translation process in which the survey is prepared in English first and translated into Chinese. It is then translated back into English to ensure the accuracy and reliability of the questions (Brislin, 1970). The survey was also verified by five senior managers in the PCB industry and amended accordingly. I also conducted a small pilot run with another five managers from the industry to ascertain if the survey questions and items were easy for them to understand. If further amendments were required, they were incorporated into the final survey.

4.3.3. Data Collection

Data were collected in 2016 using a random sample of 600 companies from the PCB and plastic rubber industries. For the PCB industry, I drew the sample from the directory of the PCB industries in Taiwan and China (TPCA, 2015). The directory comprises approximately 5200 firms. I used random sampling to select every tenth firm in the list and sent out an invitation to 520 firms to participate in the study via e-mail and post. Out of the 520 firms contacted, 380 accepted to participate. I then sent out the questionnaire via post and email to these firms, and hand-delivered approximately one fourth of the sample. After two waves of mailing, numerous follow-up calls, emails and company visits, I initially received 125 responses. Of these responses, three were not usable as these responses have too many un-answered questions. The useable surveys amounted to 122, equivalent to 32% of the 380 sample.

For the plastic rubber industry, the companies were sampled from the exhibitors list of Plas2016 Taipei industry exhibition. This includes approximately 500 firms. During the Plas2016 industry exhibition, I randomly approached 220 firms out of the total number exhibiting there and received 68 usable responses, equivalent to 31%.

To ensure the suitability of respondents, each executive in the sample companies were contacted by phone or in person. This process was used to identify the correct decision-makers for strategic alliances and explain the purpose of the study, and at the same time, request their participation in the study. When executives indicated that strategic alliance decisions were within their authority and they were willing to participate in the study, I would then send them the survey via email, post, online or in person.

Each qualified respondent would receive the survey with a letter of introduction which explained the purpose of the study and promised confidentiality for his/her participation. To follow up with survey progression, I sent emails and made phone calls to remind respondents as well as establishing a collection timeline for the survey.

4.3.4. Dependent Variable

The dependent variable of this study is firm performance. The scale is borrowed from existing literature. Previous alliance studies measure performance at alliance level, portfolio level or firm level, using objective measures or perceptual measures. For perceptual measures, scholars have used either actual performance or relative performance.

Performance measure at alliance level

At alliance level, Deeds and Rothaermel (2003) measure three items of alliance performance: spillover benefits, financial performance and overall alliance performance. Zollo et al. (2002) also use perceptual measures for alliance level performance. Respondents are asked to: (1) rate their level of satisfaction with the knowledge accumulated from participating in a particular alliance, (2) indicate the extent to which the alliance created new opportunities for the firm, (3) indicate the degree to which the alliance satisfied the partnering firm's initial objectives. Then

three indicators are standardised and summed up to construct a global measure of alliance performance.

Hoetker and Mellewigt (2009)'s alliance performance measure is based on the degree to which the alliance achieves 13 different goals, ranging from firm-specific goals (e.g. cost reduction, risk reduction, time advantages) to industry-specific goals (e.g. access to network infrastructure, access to sales network, access to technical know-how). The final measure is the weighted average of the 13 items. Lavie et al. (2012) measure alliance performance using an eight-item scale, which refer to the extent to which an alliance (1) met its objectives, (2) increased revenue, (3) improved quality, (4) reduced time to market, (5) generated new customers, products or projects, (6) led to customer satisfaction, (7) received favourable recognition, and (8) could evolve into a long-term relationship.

Shu et al. (2014) measure alliance performance with a four-item Likert-type scale. Respondents are asked to rate the level of agreement with the following statements: (1) The collaborative relationship achieved the objective of return on investments, (2) The collaborative relationship achieved the objective of sales growth, (3) The collaborative relationship achieved the objective of market share increase, and (4) The collaborative relationship achieved the objective of net profits.

Performance measure at portfolio level

Schilke and Goerzen (2010) measure alliance portfolio performance by asking respondents to rate their level of satisfaction and goal fulfillment of the business unit's R&D alliances. The statements are: (1) Overall, we are satisfied with the performance of our R&D alliances, (2) Generally, our R&D alliances satisfy our initial objectives, (3) We are satisfied with the knowledge accumulated from participating in R&D alliances, and (4) Our R&D alliances have been profitable investments.

In Duysters et al. (2012) and Heimeriks et al. (2015), alliance portfolio performance is operationalised as the percentage of alliance in which the firm's goals are realised. More specifically, respondents assess their company's overall alliance success rate in the firm's portfolio where the initial goals were realised over the last five years. The question is, 'What is your company's overall success rate (i.e. percentage of strategic alliances where goals were realised) over the past five years?'. Respondents select the success rate from 1 for (0-20%), 2 for (21-40%), 3 for (41-60%), 4 for (61-80%) and 5 for (81-100%).

Heimeriks and Duysters (2007) present a similar measure of alliance portfolio performance based on the percentage of alliances in which the original goals were realised. However, the authors use three levels of performance – low (0-40%), average (41 to 60%) and high (61-100%) – to indicate the level of alliance portfolio performance.

Kandemir et al. (2006) measure alliance network performance by capturing a firm's perceived ability to achieve its objectives associated with its alliance network. Respondents are asked to report their level of satisfaction with the following items: (1) The competitive strength of your alliance network, (2) The strength of your relationships with key alliance partners, and (3) The ability to manage crisis and conflicts with your alliance partners.

Performance measure at firm level

For firm level of performance, scholars have used self-report measures based on surveys, as well as accounting-based, market-based and innovation output measures based on secondary data. Accounting-based measures include return on assets (ROA), return on sales (ROS), return on investment (ROI) and earnings (e.g. Goerzen and Beamish, 2005, Lavie and Miller, 2008, Terjesen et al., 2011). Market-based measures

are relevant to the stock market valuation (e.g. Lavie, 2007, Wassmer and Dussauge, 2012). Innovation output measures mainly look at the number of patents granted and the number of products introduced to the markets (e.g. De Leeuw et al., 2014, Duysters and Lokshin, 2011, Lahiri and Narayanan, 2013).

Survey-based self-report measures are often related to the level of satisfaction with overall performance compared with competitors (Kandemir et al., 2006, Sarkar et al., 2009, Shu et al., 2014, Schreiner et al., 2009). In Kandemir et al. (2006), respondents were asked to rate firm performance relative to competitors in terms of sales growth, market share and market development, from 1 'much worse' to 5 'much better'.

Sarkar et al. (2009) measure market/firm performance by asking respondents to rate from 1 to 5 (' Much Worse' to 'Much Better'), how well the firm performs relative to competitors for its market share, sales growth, market development and product development. This measure is adapted from Venkatraman and Ramanujam (1986). In addition, as the sample studied has a number of public firms, Sarkar et al. (2009) test the validity of their measure by collecting three years of data on the public firms in their sample for commonly used performance measures (return on assets (ROA), return on equity (ROE) and return on investment (ROI) and sales growth (SG)) using COMPUSTAT, then correlating the average performance data with their perceptual measure of market/firm performance. The correlation between market/firm performance and average ROA, ROE, ROI and SG are all significant at $p < 0.05$. This highlights the validity of the perceptual measure.

Schreiner et al. (2009) measure firm performance data by asking respondents to report how well their firm had performed during the last three years, relative to other direct competitors, in terms of sales growth, profitability, return on investment and

ability to build customer loyalty. The respondents were asked to rate the level of firm performance compared with their key competitors on a seven-point Likert type scale (ranging from 'Far Better' to 'Far Worse'). The question is: 'During the last three years, how well did your company perform relative to your direct competitors in terms of (1) Sales growth, (2) Profitability, (3) Return on investment, and (4) Building customer loyalty'.

Shu et al. (2014) use four items to measure firm performance on a seven-point Likert scale. Respondents were asked to rate their level of agreement for the following statements: (1) Compared with our major competitors, our return on investments increased greatly, (2) Compared with our major competitors, our sales grew greatly, (3) Compared with our major competitors, our market share increased greatly, and (4) Compared with our major competitors, our net profit increased greatly.

The choice of performance measure

There are a number of reasons for the choice of performance measure. Firstly, I chose firm level performance because I am interested in studying the relationships between alliance strategy, alliance capability and firm performance. I am not interested in alliance level or portfolio level performance for my study. Secondly, I chose to use self-report measures because the sample in my study consists of listed and non-listed companies. Therefore, financial data are not available for all companies, and adequate financial information on alliances is also not readily available from secondary sources (Reuer, 2001, Hult et al., 2008). More importantly, many scholars suggest that top managers are highly knowledgeable about firm performance and much of alliance research is based on managerial evaluation of performance (e.g. Heimeriks et al., 2014, Kale et al., 2002, Kale and Singh, 2007). In light of scale validity, Sarkar et al. (2009) demonstrate that their perceptual measure of firm performance is well correlated with

financial data collected from COMPUSTAT. Thirdly, scholars suggest that using perceptual measures is more appropriate when comparing firms with different business operations or firms with different attributes (Hult et al., 2008). In my sample, firms may engage in producing highly technological PCBs or plastic materials (e.g. for the aviation industry and in advanced medical devices). In contrast, they may only produce low-end home appliance PCBs (e.g. for toasters or vacuum cleaners) or simply just household plastic chairs. The profit margin for the former group is normally higher than that of the latter group, due to the nature of their product lines. In this case, objective measures of performance are not comparable and can be misleading. Perceptual measures of performance related to competition can provide more comparable information, and control for industry effect (Judge and Douglas, 1998). Finally, scholars suggest that comparisons with competitors can reveal important firm performance information (Wiklund and Shepherd, 2003).

Following Sarkar et al. (2009)'s performance measure, I asked respondents to rate the level of firm performance compared with their key competitors on a seven-point Likert-type scale (ranging from 'Far Better' to 'Far Worse'). The question is: 'How well does your company perform relative to your competitors in terms of (1) market share, (2) sales growth, (3) market development, and (4) product development?'.

4.3.5. Independent Variable

Alliance strategy can be either a standalone strategy or a portfolio strategy. Standalone alliance strategy is when all alliances are treated as standalone occurrences; each alliance is independent from other alliances and each alliance has its own specific goals. Portfolio alliance strategy is when managers take into account the strategic implications across all alliances and the portfolio strategy reflects on overall corporate

strategy (Hoffmann, 2007).

To my knowledge, there are no published scales for standalone and portfolio strategies, as previous studies have not measured alliance strategy based on the standalone versus portfolio distinction. There are two main reasons that contribute to the lack of availability of tested scales. Firstly, alliance research has traditionally focused on single alliances, although some scholars have suggested a portfolio approach as an alternative way to manage strategic alliances (Hoffmann, 2005, Hoffmann, 2007, Ozcan and Eisenhardt, 2009). In previous studies, scholars are mainly concerned with the formation, governance, evolution and performance of single alliances. For alliance portfolio research, scholars are mainly focused on emergence, configuration and management of an alliance portfolio (Wassmer, 2010). Alliance strategies (standalone and portfolio) are treated as two separated research areas and scholars do not view them together as firm alliance strategy. Therefore, scholars have not created scales that might distinguish standalone strategy from portfolio strategy.

Secondly, scholars tend to agree on what a standalone alliance is but have different views on the definition of an alliance portfolio (Wassmer, 2010). Scholars tend to agree that a standalone alliance is an agreement between firms in which firms exchange resources and aim for sharing – or co-development of – products, technologies or services (Gulati, 1998). In contrast, scholars define alliance portfolio in a number of different ways. For example, some scholars define an alliance portfolio as the aggregate of all strategic alliances of a focal firm (Bae and Gargiulo, 2004, George et al., 2001, Hoffmann, 2005, Hoffmann, 2007, Lavie, 2007, Lavie and Miller, 2008). Others define it as all direct ties with partner firms (Baum et al., 2000, Ozcan and Eisenhardt, 2009, Rowley et al., 2000). Another group of scholars define alliance

portfolio as a focal firm's accumulated alliance experience from both ongoing and past alliances (Anand and Khanna, 2000, Hoang and Rothaermel, 2005, Kale et al., 2002, Reuer et al., 2002). In sum, different definitions for standalone alliance and portfolio alliance has led scholars to measure either at the alliance level or the portfolio level. Scholars have not created a scale that combines the two concepts. Overall, alliance portfolio research is still burgeoning, and scholars have not conceptualised alliance strategy as standalone and portfolio.

For this study, I create a new scale of alliance strategy. DeVellis (2012) suggests scholars define what the study aims to measure, and develop scales based on literature. As recommended by DeVellis (2012), I define alliance strategy and draw on the literature to develop a five-item scale. DeVellis (2012) then suggests seeking out industry experts for clarification and verification on the items developed. I therefore contacted senior managers of different companies in the target sample industry to carry out this task. DeVellis (2012) further recommends that the scale should be reviewed by academic experts and scale length optimised, then tested. I therefore contacted a second set of senior executives from the sample industry to test the survey for pilot-test. Finally, DeVellis (2012) recommends modifying items based on the feedback of the test with the second set of executives to finalise the questionnaire.

From the literature, scholars identify the motivations and benefits of forming strategic alliances, such as achieving long-term strategic goals, managing risk and uncertainty, accessing resources for synergy creation, and resource integration (Ahuja, 2000b, Gulati, 2007, Hoffmann, 2007, Lavie, 2006, Ozcan and Eisenhardt, 2009). These are the core strategic considerations for firm alliance strategy. Therefore, I developed this measure based on my definitions of alliance strategies and on the core strategic considerations suggested in the literature. The aim of this study is to see the

extent to which managers view alliances as standalone occurrences or as a portfolio of alliances. Therefore, I needed respondents to be able to distinguish the two kinds of strategies. It is important to highlight unique characteristics of these two strategies. At the same time, scholars often present portfolio perspective as a step up from the standalone perspective (Parise and Casher, 2003). Therefore, standalone and portfolio strategies can be presented as a continuum. I use strategic descriptions of the two strategies at both ends of the continuum in order to gauge the intended alliance strategy, using an anchored Likert scale. The first item uses generic descriptions of the standalone strategy and portfolio strategy. The other two items are related to core strategic considerations for firm alliance strategy. Three items are used to measure the firm's tendency towards either standalone or portfolio alliance strategy.

In item 1, I developed two descriptive statements that are based on my definitions of the two strategies. Scholars have found that the use of descriptive paragraphs is an effective means of determining a firm's strategy (James and Hatten, 1995). Therefore, I used descriptive statements at both ends of the continuum to measure a firm's alliance strategy. The statement for a standalone strategy is 'When we make alliance decisions, each alliance is considered as an independent entity and there is a specific goal for each alliance independent from other alliances'. Portfolio strategy is described as 'When we make alliance decisions, we take into account the strategic implications of all alliances that our company is engaged in, and we consider the interrelationships among alliances, including the possible synergies that can be created through the combination of the alliances'. The respondents were asked to rate which statement best describes their company's alliance strategy on a continuum (ranging from 1 to 7). Firms that choose towards 1 are inclined to a standalone alliance strategy and firms that choose towards 7 are inclined to a portfolio alliance strategy.

In item 2, I developed two descriptive statements on the importance of short-term versus long-term outcomes during alliance formation. The idea is inspired by Ozcan and Eisenhardt (2009). The authors suggest that managers who are able to view their alliances in the context of the firm's industry are likely to develop a high-performing alliance portfolio. Managers focused on the firm's industry are likely to be concerned with the growth opportunities, future trends and development. This implies that they need to plan for a longer time horizon. I interpret that these managers with a long-term perspective are more likely to take a portfolio strategy. I developed a scale of 1 to 7 whereby 1 is 'We mainly consider short-term outcome during alliance formation', and 7 is 'We mainly consider long-term alliance development goals during alliance formation'. I asked respondents to indicate the level of prioritisation for either orientations rather than importance, because respondents may feel that both short- and long-term outcomes are important when asked this question. By assessing how managers perceive the level of prioritisation, I can gauge the tendency of firm's alliance strategy: managers adopting a standalone strategy tend towards short-termism, whereas managers adopting a portfolio strategy are more concerned with long-term viability and development.

For item 3, I drew on literature related to alliance risk and uncertainty. Strategic alliances allow firms to manage risk and uncertainty (Hoffmann, 2007, George et al., 2001). Managers tend to have different risk propensity, and strategic choices are influenced by the risk preference of the decision-makers (Hoffmann, 2007). I asked respondents how they manage alliance risk and uncertainty by using two descriptive statements. At one end of the continuum, the statement reads, 'We manage risk and uncertainty of individual alliances in an independent manner'. On the other end of the continuum, the statement reads, 'We manage risk and uncertainty of all alliances

together in an integrated manner'. When managers do not view managing risk and uncertainty in an integrated manner, they are likely to adopt a standalone strategy, because this strategy is less concerned with managing overall risk and uncertainty whereas a portfolio strategy encourages managers to consider the risk implications of different alliances combined. Therefore, having the managerial view on risk and uncertainty can indicate the tendency of choosing an alliance strategy.

Each item reflects the core strategic considerations of forming alliances. These statements indicate the tendency of managerial strategic consideration during alliance decision-making. At one end of the spectrum are those firms whose alliance strategy is to take a holistic view on their alliances, have a long-term perspective into forming alliances, managing overall risk and uncertainty (Hoffmann, 2007, Parise and Casher, 2003, Vapola et al., 2010, Vassolo et al., 2004). These firms are likely to have a portfolio alliance strategy. At the other end of spectrum are firms whose alliance strategy is more standalone, ad hoc basis, short-term result oriented, more focused on risk and uncertainty related to individual alliance and less concerned with overall effect of alliances join together. These firms are likely to have a standalone alliance strategy. Therefore, the three-item Likert scale for alliances strategy can tap into a firm's alliance strategic orientation and is suitable for the measurement of alliance strategy.

4.3.6. Mediating Variable

The mediating variable for this study is alliance capability. In particular, I argue that firms need different capabilities to manage alliances either as individual alliances or as a portfolio of alliances. Managing a portfolio of alliances is not the same as managing individual alliances (Kale and Singh, 2009, Schreiner et al., 2009). In a recent alliance capabilities review paper, Wang and Rajagopalan (2015) suggest that

individual-alliance capability differs from portfolio-alliance capability. However, they do not elaborate on the specific differences between the two kinds of alliance capabilities. For the purpose of my research, individual-alliance capability is the capability needed to manage individual alliances. It is related to skills in managing the life cycle of an alliance. Portfolio-alliance capability is concerned with firm's ability to initiate and manage a portfolio of alliances (Heimeriks and Duysters, 2007, Wang and Rajagopalan, 2015). In general, most alliance capability studies do not seek to distinguish individual-alliance capability or portfolio-alliance capability. Table 3-1 shows the key studies that use alliance capability measures.

Overall, scholars develop items to measure different dimensions or aspects of alliance management capabilities relevant to their context of the studies. Some focus on single alliance management in general and use measures that are more related to single alliance rather than a portfolio of alliances (e.g. Schreiner et al., 2009, Simonin, 1997). Others purport to focus on portfolio management capability (e.g. Kandemir et al., 2006, Sarkar et al., 2009, Schilke and Goerzen, 2010). However, the measures of portfolio-alliance capability may also include capability related to managing single alliances. This is because scholars do not clearly distinguish individual-alliance capability and portfolio-alliance capability. In Table 4-1, I list the items used in each of the key alliance capability studies, then categorize these items into individual-alliance capability and portfolio-alliance capability. The last two columns indicate the items that I classify as either individual-alliance capability or portfolio-alliance capability, based on my definitions and my hypotheses.

Table 4 - 1: Measures used in key alliance capabilities studies

Simonin (1997) AM Corporate collaboration Know-how			**Type of capability (My classification)**	
Dimensions		Items CR=0.82, 1= not at all, 4 = moderate, 7= great deal of expertise	Individual	Portfolio
Partner searching	1	Partner selection	√	
	2	Partner identification	√	
	3	Understanding strategic implications of collaborating	√	
Negotiation	1	Estimate assets value and future cash flow	√	
	2	Tax aspect	√	
	3	Closing the deal	√	
	4	Legal aspect	√	
	5	Negotiation	√	
Management	1	Building trust with the partner	√	
	2	Managing alliance-parent company relations	√	
	3	Conflict resolution	√	
	4	Logistic and resource transfer	√	
	5	Renegotiating initial agreements with partner	√	
	6	Staffing	√	
	7	Cross-cultural training	√	
	8	Technological assessment	√	
Knowledge & skills transfers	1	Knowledge-skills acquisition	√	
	2	Knowledge-skills safeguarding	√	
Exit	1	Profit and capital repatriation	√	
	2	Exiting from the alliance	√	
Schrenier et al., (2009) SMJ Alliance Management Capability				
		1 =strongly disagree to 7= strongly agree		
Coordination CR= 0.83 AVE= 0.56	1	For coordinating partner-related activities, we have established internal processes (e.g., for marketing, project coordination) within our company.	√	
	2	For the cooperation with partner P, we have established cross-company processes, meaning reaching across company boundaries.	√	
	3	Within our company, we meet regularly to adapt our working procedures to partner P	√	
	4	Within our company, we have adjusted our incentive systems (bonus, goal agreement) to serve the goals of the partnership with partner P.	√	
Communication CR= 0.86 AVE= 0.57	1	On any given occasion, we can explain the win-win situation of the cooperation to partner P (e.g., win-win at invitation to bid).	√	
	2	We try to achieve an instant link of certain customer needs to our name in partner P.	√	
	3	We make an effort to let partner P know exactly our market positioning.	√	
	4	We always make an effort to make partner P understand our service and product offering.	√	
	5	When organizational changes occur, we always inform partner P about the new contact persons in our company.	√	
Bonding CR= 0.87 AVE= 0.53	1	Even in difficult situations, we signal readiness for discussion toward partner P.	√	
	2	We stand by partner P's side even in difficult situations	√	
	3	We listen attentively when partner P explains problems to us.	√	
	4	We care about the concerns of partner P even if we do not expect any advantages to arise for us in the short term.	√	
	5	During conversations we feel intuitively what partner P actually wants	√	
	6	When discussing points of disagreement, we always try to see partner P's point of view.	√	
Kandemir et al., (2006) JAMS Alliance Orientation,				
		1 Strongly disagree to 7 strongly agree		
Alliance scanning CR= 0.84	1	We actively monitor our environment to identify partnership opportunities.	√	
	2	We routinely gather information about prospective partners in various forums (e.g. trade shows, industry convention, databases, publications, internet, etc.…)	√	
	3	We are alert to market developments that create potential alliance opportunities	√	
Alliance Coordination CR= 0.81	1	Our activities across different alliances are well coordinated		√
	2	We systematically coordinate our strategies across different alliances		√
	3	We have processes to systematically transfer knowledge across alliance partners		√
Alliance Learning CR= 0.77	1	We conduct periodic reviews of our alliances to understand what we are doing right and where we are going wrong		√
	2	We periodically collect and analyze field experiences from our alliances		√
	3	We modify our alliance related procedures as we learn from experience		√

		Sarkar et al., (2009) OS Portfolio Management Capability	Type of capability (My classification)	
Dimensions		Items 1= strongly disagree to 7 strongly agree	Individual	Portfolio
Alliance Proactiveness CR=0.87 AVE=0.58	1	We actively monitor our environment to identify partnership opportunities	√	
	2	We routinely gather information about prospective partners in various forum (e.g. trade shows, industry convention, databases, publications, internet, etc.…)	√	
	3	We are alert to market developments that create potential alliance opportunities	√	
	4	We strive to preempt our competition by entering into alliances with key firms before our competitors can	√	
	5	We often take the initiative in approaching firms with alliance proposals	√	
Alliance portfolio Coordination CR=0.82 AVE=0.55	1	We consider our alliances as a portfolio that requires overall coordination and not as independent, one-off arrangements **		√
	2	Our activities across different alliances are well coordinated		√
	3	We systematically coordinate our strategies across different alliances		√
	4	We have processes to systematically transfer knowledge across alliance partners		√
	5	Managers from different departments meet periodically to examine how we can create synergies across our alliances **		√
Relational Governance CR=0.79 AVE=0.47	1	Staying together during adversity/challenge is very important in our relationships XX	√	
	2	We endeavor to build relationships based on mutual trust and commitment	√	
	3	We strive to be flexible and accommodate partners when problems/needs arise	√	
	4	When disagreement arise in our alliances, we usually reassess facts to try and reach a mutually satisfactory compromise	√	
	5	Information exchange with partners takes place frequently and informally, and not only according to prespecified agreements XX	√	
		** items droped from the scale		
Schilke and Goerzen (2010) JM Portfolio Management Capability				
		1= strongly disagree to 7 strongly agree		
Inter-organizational learning CR=0.87 AVE=0.63	1	We have the capability to learn from our R&D alliance partners.	√	
	2	We have the managerial competence to absorb new knowledge from our R&D alliance partners.	√	
	3	We have adequate routines to analyze the information obtained from our R&D alliance partners.	√	
	4	We can successfully integrate our existing knowledge with new information acquired from our R&D alliance partners.	√	
Alliance proactiveness CR=0.87 AVE=0.63	1	We strive to preempt our competition by entering into R&D alliance opportunities.	√	
	2	We often take the initiative in approaching firms with R&D alliance proposals.	√	
	3	Compared to our competitors, we are far more proactive and responsive in finding and "going after" R&D partnerships.	√	
	4	We actively monitor our environment to identify R&D partnership opportunities.	√	
Alliance transformation CR=0.82 AVE=0.6	1	We are willing to put aside contractual terms to improve the outcome of our R&D alliances.	√	
	2	When an unexpected situation arises, we would rather modify an R&D alliance agreement than insist on the original terms.	√	
	3	Flexibility, in response to a request for change, is characteristic of our R&D alliance management process.	√	
Inter-organizational coordination CR=0.83	1	Our activities with R&D alliance partners are well coordinated.		√
	2	We ensure that our work is synchronized with the work of our R&D alliance partners.		√
	3	There is a great deal of interaction with our R&D alliance partners on most decisions.		√
Alliance portfolio coordination CR=0.91 AVE=0.72	1	We ensure an appropriate coordination among the activities of our different R&D alliances		√
	2	We determine areas of synergy in our R&D alliance portfolio.		√
	3	We ensure that interdependencies between our R&D alliances are identified.		√
	4	We determine if there are overlaps between our different R&D alliances.		√

As shown in Table 4-1, Simonin (1997) and Schreiner et al. (2009) are two studies that provide measures for individual-alliance capability. Schreiner et al. (2009)'s measure includes coordination, communication and bonding dimensions of individual alliances. Simonin (1997)'s measure covers a wide range of capabilities from pre-formation (e.g. partner searching and negotiation) to post-formation (e.g. negotiation, knowledge and skills transfers and exit). Overall, Simonin (1997)'s measure is broader and covers more aspects of individual-alliance capability than Schreiner et al. (2009)'s measure. Simonin (1997) uses five areas of managerial expertise to gauge capabilities for managing individual alliances and develop items relevant to each area of expertise. These areas are: (1) partner searching know-how, including items on partner selection, partner identification, and understanding strategic implications of collaborating; (2) negotiation know-how, including estimating assets value and future cash flow, tax aspect, closing the deal, legal aspect and negotiations; (3) management know-how, including building trust with the partner, managing alliance-parent company relations, conflict resolution, logistics and resource transfer, renegotiating initial agreements with partner, staffing, cross-cultural training, and technological assessment; (4) knowledge and skills transfers, including knowledge-skills acquisition and knowledge-skills safeguarding, and (5) exiting skills, including profit and capital repatriation, and exiting from the alliance. Each item is measured on a seven-point Likert-type scale and anchored by (1= not at all, 4 = moderate, 7 = great deal of expertise).

Based on my classification shown in Table 4-1, Kandemir et al. (2006), Sarkar et al. (2009), and Schilke and Goerzen (2010) all have both individual-alliance capability and portfolio-alliance capability in their alliance capability measure. Kandemir et al. (2006) measure alliance orientations, including alliance scanning,

alliance coordination and alliance learning. Alliance scanning measures the extent to which a firm proactively engages in scanning for partnering opportunities. This dimension is more relevant to individual-alliance capability. Alliance coordination assesses the extent to which a firm engages in coordinating among its network partners. Alliance learning measures the extent to which firms learn from experience. I classify Kandemir et al. (2006)'s alliance coordination and alliance learning measures as portfolio-alliance capability.

Sarkar et al. (2009) measure alliance portfolio capability using three dimensions, including alliance proactiveness, relational governance and alliance portfolio coordination. Alliance proactiveness is similar to Simonin (1997)'s measure of partner searching and Kandemir et al. (2006)'s measure of alliance scanning, all of which are related to individual-alliance capability. Relational governance is similar to the 'management capability' for individual-alliance capability in Simonin (1997)'s measure. Both the management dimension of Simonin (1997) and the relational governance dimension of Sarkar et al. (2009) are concerned with building a long-lasting trust relationship with partners and with conflict resolution. Alliance portfolio coordination is the only dimension I classified as portfolio-alliance capability. This is similar to Kandemir et al. (2006)'s alliance coordination.

Schilke and Goerzen (2010)'s measure of portfolio management capability includes interorganisational coordination, alliance portfolio coordination, interorganisational learning, alliance proactiveness and alliance transformation. These different dimensions include both individual-alliance and portfolio-alliance capabilities. The authors consider these five dimensions as portfolio management capability. However, I classify alliance proactiveness, alliance transformation and interorganisational learning as individual-alliance capabilities, because these items are

particularly important and relevant to individual alliances. For example, the items for measuring alliance proactiveness are concerned with managerial ability to identify partnerships and find suitable alliance opportunities. The items for measuring alliance transformation are relevant to the managerial ability required for pre-formation and post-formation for each individual alliance. The items for measuring interorganisational learning are important aspects for knowledge transfers throughout the life cycle of an individual alliance. Therefore, these three constructs are classified as individual-alliance capabilities.

For interorganisational coordination and alliance portfolio coordination, both measures are relevant to portfolio-alliance capabilities in my study. For example, the measures of interorganisational coordination are concerned with the coordination and synchronisation with different alliance partners within an alliance portfolio. Alliance portfolio coordination is relevant to synergy and interdependencies among partners. Therefore, I classify Schilke and Goerzen (2010)'s portfolio management capabilities into individual-alliance capabilities and portfolio-alliance capabilities as show in Table 4-1.

From the review of these scales used in different studies, I used Schilke and Goerzen (2010)'s scale for measuring both individual-alliance capability and portfolio-alliance capability. This is because Schilke and Goerzen (2010)'s measure has more dimensions than Kandemir et al. (2006) and Sarkar et al. (2009) and provides a more complete measure for both individual-alliance and portfolio-alliance capabilities. However, Schilke and Goerzen (2010)'s measure only specify R&D alliances. For my study, I do not specify R&D alliances. Respondents were asked to indicate the level of agreement with the items for each dimension, on a scale of 1 'strongly disagree' to 7 'strongly agree'. I asked respondents to assess the level of

agreement with each listed aspect of capability. When coding these variables, individual alliance capabilities, which include three dimensions – alliance proactiveness, alliance transformation and interorganizational learning – I calculated a total score that add up the measures of each dimension. Portfolio alliance capabilities which cover two dimensions – interorganisational coordination and portfolio alliance coordination – I also used a total score that adds up the measures of the two dimensions.

4.3.7. Control Variable

Several control variables are included in this study. Firstly, I controlled for the potential effects relevant to the characteristics of the firm such as firm size, firm age, international sales, R&D orientation, past performance, two different industry effects and country effect. Secondly, I controlled for the characteristics of alliances such as alliance experience and alliance function. Thirdly, I controlled for respondents' characteristics such as age, educational level, major in business, elite education, tenure and functional background. These control variables may have a confounding effect and potentially influence the effect of alliance strategy on firm performance.

Firm size

Large firms will have more resources to establish alliances and may have more experience as well, which may also have a possible size effect on firm performance (Brouthers et al., 2014). Therefore, I used the total number of employees to control for the effect of firm size on firm performance. Firm size is measured as the number of full-time employees.

Firm age

Longer-established firms may have more experience in forming alliances and may exert an experiential effect on firm performance (Hoang and Rothaermel, 2005).

Firm age is measured as the number of years since its founding up until 2016. I asked respondents to provide the founding year of the firm.

International sales

Similar to (Brouthers and Nakos, 2005), I controlled for a firm's export dependency, which was measured as a percentage of a firm's international sales to a firm's total sales, because firms that depend highly on exports may impact performance differently compared to firms less dependent upon export sales. Therefore, it is included as a control variable. I follow Brouthers and Nakos (2005) and operationalised it as the firm's ratio of foreign sales to total sales. I asked respondents to report the ratio of their foreign sales to total sales.

R&D orientation

Gatignon and Xuereb (1997) defined R&D oriented firm as 'a firm with the ability and the will to acquire a substantial technological background and to use it in the development of new products'. Scholars suggest that R&D orientation is related to firm performance outcomes (Cooper, 1984, Gatignon and Xuereb, 1997). It is likely that a firm with a high degree of R&D orientation may influence firm performance. Therefore, I followed Schilke and Goerzen (2010) by including R&D orientation as a control and using a single item to measure this variable. Respondents were asked to indicate the level of agreement with the statement on a seven-point scale, ranging from 1 ('Strongly Disagree') to 7 ('Strongly Agree'). The statement is: 'In our company, we emphasise Research and Development activities'.

Past performance

Past performance may influence firm alliance strategy because a firm may take strategic action based on past performance in an attempt to improve firm performance. This means that past performance has a potential effect on a firm's choice of alliance

strategy and future performance. Previous studies control for past performance using different measures and timeframes (Baum and Wally, 2003, Wiklund and Shepherd, 2003, Santhanam and Hartono, 2003, Andrevski et al., 2013). For example, Baum and Wally (2003) measure past performance with two types of firm performance: growth and profitability. Growth is measured with two items: (1) the percentage change in annual sales from 1996 to 2000 and, (2) the percentage change in year-end employment from 1996 to 2000. Profit is measured with one item: the average annual 'pretax net profit percentage of assets' for 1998, 1999, and 2000. Wiklund and Shepherd (2003) directly ask respondents to compare past performance with competitors in terms of net profit, sales growth, cash flow and growth of net worth. The items use a five-point Likert scale, ranging from 1 'Much worse than its competitors' to 5 'Much better than its competitors'. Cronbach alpha is 0.76. Santhanam and Hartono (2003) take into account past performance not through a control variable, but by adjusting for current performance. The authors measure financial performance in two categories: profit ratios and cost ratios. Profit ratios include return on sales, return on assets, operating income to assets, operating income to sales and operating income to employees. Cost ratios include cost of goods sold to sales, selling and general administration expenses to sales and operating expenses to sales. Data are collected from a secondary data source (COMPUSTAT) for current and previous years. Past performance is controlled through adjusting current performance, and by regressing prior year performance on current year performance. In alliance studies, Andrevski et al. (2013) control for past performance using return on equity (ROE) and data are collected from a secondary source.

Past performance based on financial data is relatively accessible. However, tested scales for past performance measures are relatively limited. I followed Schreiner

et al. (2009)'s performance measure because it is used in the context of alliance and it asks respondents to rate their firm's performance compared to its competitors over a three-year timeframe. This appears to be relevant for measuring a firm's past performance. Schreiner et al. (2009)'s measure is similar to Wiklund and Shepherd (2003)'s measure of past performance, but the items are different. Wiklund and Shepherd (2003) consider net profit, sales growth, cash flow and growth of net worth, while Schreiner et al. (2009) consider sales growth, profitability, return on investment, building customer loyalty. The Cronbach alpha for Schreiner et al. (2009) is higher at 0.93 and Wiklund and Shepherd (2003) is at 0.76. Therefore, following Schreiner et al. (2009), I asked respondents to rate the level of firm performance compared with their competitors on a seven-point Likert-type scale (ranging from 'Far Better' to 'Far Worse'). The question is: 'During the last three years, how well did your company perform relative to your direct competitors in terms of (1) sales growth, (2) profitability (3) return on investment (4) building customer loyalty?'.

Industry effect 1 & 2

Strategic alliances in certain high technology industries may be more active than others (Hagedoorn, 2002). Also, alliances in some industries perform better than those in others owing to differences in industry structure (Krishnan et al., 2006). Hitt and Tyler (1991) found that industry affects the criteria used to make acquisitions. Many scholars have argued the importance of industry in determining the strategies employed by the firms (Hitt et al., 2000). Scholars suggest that it is important to include an industry effect as a control variable. I used Schilke and Cook (2013)'s opening question 'Which of the following is your company's primary industry sector?' but provide a selection list based on the primary industry in my sample: 1 for manufacturing and contract manufacturing, 2 for equipment and machinery, 3 for

materials, chemicals and Accessories, 4 others, please specify. I used dummy variables. Manufacturing and contract manufacturing serves as the base relative to which the effects of the other dummies (equipment and machinery; materials, chemicals and accessories; others) are measured.

In addition, another industrial control has been included to distinguish companies from the PCB industry and companies from plastic rubber industry. This is also coded as a dummy variable.

Country effect

This effect is also coded as a dummy variable in order to distinguish the differences between firms from China and firms from Taiwan. Although they are similar and may be considered as the same country, managerial concepts and practices may be different. Institutional theory suggests that different countries may have different institutional distance as well as psychic distance (Brouthers, 2013b, Brouthers et al., 2008). China and Taiwan do have different legal and institutional practices. This is likely to have impact on managerial strategic orientation; therefore, it is important to control for possible difference.

Alliance experience

Alliance experience is concerned with the extent to which a firm has been involved in strategic alliances (Schilke and Goerzen, 2010). It is likely that a firm more experienced in strategic alliances may have a better firm performance. It may potentially influence the relationship between diversity and firm performance. Therefore, it is included as a control variable. Following Zollo et al. (2002) and Schilke and Goerzen (2010), where alliance experience is measured as the number of strategic alliances within the past five years, respondents were asked to indicate the number of strategic alliance formed by the firm within the past five years.

Alliance function

Alliance function is defined as 'a position to manage or coordinate all alliance-related activity in the firm' (Kale et al., 2002). When a firm has an alliance function, this function directs all alliance-related operations. It may influence how a firm forms and manages its alliances, and potentially influences alliance strategy. Also, scholars have shown that firms with alliance functions achieve better performance results (Kale et al., 2002). Thus, alliance function can also influence firm performance. Therefore, alliance function is included as a control variable. I followed Kale et al. (2002)'s definition and asked respondents to indicate whether their company has a formal, dedicated alliance function or department that has responsibility for the firm's alliances.

Respondent's age

Executives' age may influence strategic decision-making because it is related to risk propensity and a manager's experience (Brouthers et al., 2000, Bantel and Jackson, 1989, Hambrick and Mason, 1984, Wiersema and Bantel, 1992). Potentially, age may affect the moderating effect of alliance strategy because studies have shown that executives' age is related to risk propensity and firm strategic choice (Brouthers et al., 2000, Hitt and Tyler, 1991). Thus, it is likely to influence the choice of alliance strategy. Therefore, I included age as a control variable. I used the age measure of Brouthers et al. (2000), whereby age is a continuous two-digit number reported by each respondent.

Education

I controlled for three education related variables: level of education, major in business and elite education, because educational background may influence managerial strategic orientation (Hitt and Tyler, 1991, Brouthers et al., 2000) and

potentially influence firm alliance strategy. More highly educated managers may develop better cognitive abilities, which affects how they formulate alliance strategy. Different education specialisation tends to have different decision-making rules developed through particular academic training, and may influence the choice of alliance strategy. Therefore, I controlled for executives with major in business. In addition, managers with an elite education may have more valuable social capital (Cao et al., 2012) which has the potential to present more opportunities for alliance formation and also influence their alliance strategy. For level of education, I followed Brouthers et al. (2000) and Bantel and Jackson (1989), providing five categories ranging from high school to doctorate. (i.e. junior high school, high school, undergraduate degree, masters degree and doctoral degree). The categories of educational levels have been changed to reflect the education systems in China and Taiwan. I asked respondents to select the education level attained from the following categories: 1 for junior high school and below, 2 for high school education, 3 for undergraduate degree, 4 for master's degree and 5 for doctor of philosophy (Ph. D).

For type of education, I included 10 categories to reflect the major areas of study in China and Taiwan. These categories are chosen from Bantel and Jackson (1989), Hitt and Tyler (1991) and Wiersema and Bantel (1992). The respondents are requested to choose from the following selections: 1 for accounting/finance, 2 for business/management/marketing, 3 for science, 4 for engineering, 5 for IT and computing, 6 for law, 7 for language, 8 for art and design, 9 sociology and social studies and 10 for other fields that respondents can specify. When coding, this variable is coded as a dummy variable, 0 (Zero) for major in business such as 1 for accounting/finance and 7 for business/management/marketing. 1 (One) for all other categories.

For elite education, I asked respondents to specify the education establishments they have attended for undergraduate and postgraduate studies in an open-ended question. When coding, I referred to the ranking of the respondent's university in their country of education (See appendix A and B for China and Taiwan). If respondents were educated overseas, I checked with the university ranking in the corresponding countries. If overseas educated executives graduated from the top 20 education institutes in the specific countries, they were considered as graduating from elite universities. The variable is coded as 0 (Zero) if the respondent did not complete a formal degree or did not have any degree from an elite university. Coded for 1 (One) if the respondent had either an undergraduate degree or post graduate degree from an elite university.

Tenure

I controlled for executive's tenure. Tenure can be categorised into three types: positional tenure, firm tenure and industrial tenure. For this study, I used positional tenure as a control variable. Positional tenure is defined as the number of years a top executive has been employed in his or her current position. Positional tenure may influence strategic decision-making because managers may build and obtain different firm knowledge and social capital in different stages of the tenure (Hambrick and Fukutomi, 1991). I followed Bantel and Jackson (1989), and asked respondents to specify the year he/she joined the current company and his/her current position. Tenure is thus a continuous measure.

Functional background

Executive functional background may influence managerial strategic choice (Hambrick and Mason, 1984, Waller et al., 1995), and potentially influence the moderating effect of firm alliance strategy because functional background influences

how executives develop their knowledge, skills and strategic orientation (Herrmann and Datta, 2006). Their functional background determines what particular skill set they have, which is likely to influence firm alliance strategy. For example, Geletkanycz and Black (2001) document that executives in the functional areas of finance, marketing, law and general management are most strongly related to strategic commitment to the status quo. This implies that these managers may be less willing to formulate new strategy and influence the choice of firm alliance strategy. Therefore, it has been included as a control variable. I draw on Bantel and Jackson (1989) for the opening question 'The functional area in which you had the most experience?' and follow Bunderson and Sutcliffe (2002) for the categories to select from, because their categories are more suited to my sample industry (i.e. sales or marketing, manufacturing, finance or accounting, personnel/HR, distribution or warehouse, R&D, equipment management, administrative support, and general management). When coding, Functional background is coded as a dummy variable, 0 (Zero) for all other functional backgrounds (manufacturing, distribution or warehouse, R&D, equipment management, finance accounting, personnel/HR, administrative support and general management) and 1 (One) for output functional background (sales and marketing).

4.3.8. Statistical Analysis

Firstly, I described the data composition of the sample such as key statistics of the firm (e.g. firm size, percentage spread of the different industries). Secondly, I tested for common methods variance, and reliability and validity statistically.

Common methods variance

As with all self-reported data, there is a potential for common method bias resulting from single-respondent response (Chang et al., 2010, Podsakoff et al., 2003). In order to prevent common method bias, I followed the suggestions from Chang et al.

(2010) and Podsakoff et al. (2003). Firstly, through the design of the study's procedure, Chang et al. (2010) suggest using different response formats to measure different variables when designing the questionnaire. For dependent variables, a four-item seven-point Likert-type scale was used to measure firm performance. For the independent variables, I used a mixture of open-ended questions and listed choices for selection. These can prevent respondents choosing the same response pattern, which may affect the accuracy of data (Brouthers et al., 2000).

Secondly, through statistical tests, factor analysis was used in which all items from each of the constructs load into an exploratory factor analysis to determine whether the majority of the variance between measures can be accounted for by one general factor (Chang et al., 2010). The logic behind this test is that if common method variance is a serious issue in the data, a single factor will emerge or one general factor will account for most of the covariance in the dependent and independent variables (Podsakoff et al., 2003). If the model does not achieve an acceptable fit, then it should not have a single common method factor. This statistical test can increase the reliability of the data for interpretation (Brouthers et al., 2003). However, Chang et al. (2010) and Podsakoff et al. (2003) suggest that Harman's one-factor test is not sufficient to claim that common method variance is not an issue. Confirmatory factor analysis (CFA) was used to overcome the drawback of the one-factor test and further test potential common method bias among variables in my survey (Podsakoff et al., 2003). All items of the survey were loaded to a common method factor, and if the fit indexes for the data were not an acceptable fit, this would suggest that common method variance is less likely to influence the observed relationship among variables in the study.

Reliability and validity

Before testing the hypotheses, I used confirmatory factor analysis (CFA) to evaluate the validity of the measures. The CFA measurement will be reported to see if the model fits with the data satisfactorily. If the results show that all standardised item loadings are significantly greater than zero ($p \leq 0.01$), positive, and high in magnitude (≥ 0.65), they provide evidence of convergent validity (Hair et al., 2009).

I also conducted further testing for individual-alliance capability, portfolio-alliance capability, alliance strategy and firm performance constructs using Cronbach's alphas (α) and average variances extracted (AVE) for these multi-item constructs. The result is reported and presented in Table 4-2. If all values for each construct exceed the recommended thresholds i.e. (α) ≥ 0.7 and (AVE) ≥ 0.5, then these measures demonstrate adequate convergent validity and reliability (Bagozzi and Yi, 2012, Bagozzi and Yi, 1988).

Hypotheses Testing

To test for my Hypotheses H1 to H3, I used the process procedure (Hayes, 2013) in the Statistical Package for the Social Sciences (SPSS). This allows for testing a direct relation between alliance strategy and firm performance (H1) as well as examining the impact of the indirect relationship for one independent variable on the relationship between another independent and dependent variable (H2 and H3) (Preacher et al., 2007).

4.4. Results

4.4.1. Validity and Reliability

I first conducted analysis for each measurement construct. Cronbach alpha, composite reliability (CR) and average variance extracted (AVE) are indicative of reliability and validity of each individual construct. Convergent validity was indicated

by the fact that all standardised loadings were above 0.68 and significant ($p < 0.01$). The standardised loading for reflective indicator was ideal at 0.7 (Hair, 2009). Composite reliabilities ranged from 0.74 to 0.92, which are above the benchmark of 0.7 (Fornell and Larcker, 1981, Hair, 2009). The average variance extracted (AVE) measures the amount of variance captured by a construct's measure relative to measurement error. All constructs achieved recommended levels of 0.5 (Fornell and Larcker, 1981, Hair, 2009). The results for each construct are reported in Table 4-2.

Discriminant validity analysis was firstly conducted with a more rigorous test based on Fornell and Larcker (1981), to compare the average variance extracted values with the squared correlation for each of the constructs (Hair, 2009). The average variance extracted estimates should be greater than the squared correlation estimate between the latent variable and all other latent variables. Alternatively, the square root of every average variance extracted for each construct is greater than the specific correlations with any of the other constructs. The result of discriminant validity is shown in Table 4-3. Discriminant validity is shown when each measurement item correlates weakly with all other constructs except for the one to which it is theoretically associated. The two mediating variables – *individual-alliance capabilities* and *portfolio-alliance capabilities* – were marginally less by 0.01 of the square root of the AVE.

Secondly, correlation analysis was conducted. The majority of inter-item correlations between variables were all relatively low, generally falling between 0.02 and 0.7. There were a few exceptions which had correlation values exceeding 0.6, one of which was the correlation between a control variable and a dependent variable, i.e. past performance and firm performance. This shall not be a concern, as the correlation occurs between control and dependent variable is acceptable. Also, the correlation

between the two moderating variables – *individual-alliance capabilities* and *portfolio-alliance capabilities*, were at 0.778 – that is higher than the recommended value of 0.7 (Hair, 2009). However, these two mediating variables were not included in the same regression for my mediating analysis. The descriptive statistics and correlations are summarised in Table 4-4; the majority of inter-item correlations between those variables are relatively low, at low to moderate levels. This is one indication that the variables are unidimensional and that there exists, as a result, good validity which does not threaten discriminant validity.

Thirdly, the variance inflation factors (VIF) were examined, because the result of correlation analysis showed a slightly higher correlation between the two mediating variables – *individual-alliance capabilities* and *portfolio-alliance capabilities*, which may be a concern for multicollinearity. I found that all VIF scores were less than the recommended values between 3 to 5 (Hair, 2009), indicating a low probability of multicollinearity (See Table 4-5).

Table 4 - 2: Measurement scales – reliability, convergent validity and divergent validity

Construct items	Standardized loadings	Cronbach alpha	Composite Reliability	AVE
Past Performance				
During the last 3 years, how well did your company perform relative to your direct				
1. Sales growth	0.80	0.89	0.90	0.68
2. Profitability	0.90			
3. Return on Investment	0.83			
4. Building customer loyalty	0.77			
Firm Performance				
Currently, how well is your company performing relative to your competitors in terms of:				
1. Market Share	0.79	0.88	0.88	0.65
2. Sales Growth	0.86			
3. Market Development	0.81			
4. Product Development	0.77			
Alliance Strategy				
When we make alliance decisions, each alliance is considered as an independent entity and there is a specific goal for each alliance independently from other alliances **VERSUS** When we make alliance decisions, we take into account the strategic implications of all alliances that our company is engaged in, and we consider the inter-relationships among alliances, including the possible synergies that can be created through the combination of the alliances	0.91	0.84	0.85	0.66
We mainly consider short-term outcome during alliance formation **VERSUS** We mainly consider long-term alliance development goal during alliance formation	0.80			
We manage risk and uncertainty of individual alliances in an independent manner **VERSUS** We manage risk and uncertainty of all alliances together in an integrated manner	0.70			
Alliance Capabilities				
Alliance Proactiveness				
We strive to preempt our competition by entering into alliance opportunities	0.85	0.91	0.91	0.71
We often take the initiative in approaching firms with alliance proposals	0.83			
Compared to our competitors, we are far more proactive and responsive in finding and	0.85			
We actively monitor our environment to identify partnership opportunities	0.83			
Alliance Transformation				
We are willing to put aside contractual terms to improve the outcomes of our alliances	0.82	0.83	0.83	0.72
When an unexpected situation arises, we would rather modify an alliance agreement than	0.87			
Flexibility, in response to a request for change, is characteristics of our alliance	Deleted			
Inter-organizational Learning				
We have the capability to learn from our alliance partners	0.78	0.88	0.88	0.65
We have the managerial competence to absorb new knowledge from our alliance partners	0.87			
We have adequate routines to analyze the information obtained from our alliance partners	0.75			
We can successfully integrate our existing knowledge with new information acquired from	0.81			
Inter-organizational Cooridnation				
Our activities with alliance partners are well coordinated	0.77	0.84	0.84	0.64
We ensure that our work is synchronized with the work of our alliance partners	0.83			
There is a great deal of interaction with our alliance partners on most decisions	0.80			
Portfolio Coordination				
We ensure an appropriate coordination among the activities of our different alliances	0.79	0.87	0.87	0.63
We determine areas of synergy in our alliance portfolio	0.78			
We ensure that interdependencies between our alliances are identified	0.78			
We determine if there are overlaps between our different alliances	0.82			
Marker Variable				
I often play on-line games	0.94	0.95	0.95	0.88
I like to play on-line games	0.97			
I am very experienced at playing on-line games	0.90			
Alliance Capabilities				
Alliance Proactiveness	0.89	0.856	0.916	0.688
Alliance Transformation	0.84			
Alliance Learning	0.76			
Alliance Cooridnation	0.73			
Portfolio Coordination	0.92			
Individual Alliance Capabilities				
Alliance proactiveness	0.84	0.77	0.82	0.60
Alliance transformation	0.78			
Inter-organizational learning	0.70			
Portfolio Alliance Capabilities				
Inter-organizational cooridnation	0.67	0.68	0.74	0.60
Portfolio coordination	0.86			

Table 4 - 3: Discriminant validity of constructs

Discriminant Validity of Constructs					
	1	2	3	4	5
Performance	**0.82**				
Past Performance	0.73	**0.81**			
Alliance Strategy	0.24	0.28	**0.81**		
Individual Alliance Capabilities	0.83	0.63	0.35	**0.77**	
Portfolio Alliance Capabilities	0.85	0.65	0.37	0.78	**0.77**
The diagonal items - the square root of average variance extracted.					
The off diagonal items - the square correlation between construct					

Table 4 - 4: Correlation matrix

Correlations

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Firm Performance	1																				
2	Alliance Strategy	.239**	1																			
3	Individual-alliance Capabilities	.831**	.350**	1																		
4	Portfolio-alliance Capabilities	.854**	.373**	.778**	1																	
5	Firm Age	.176*	.065	.180*	.155*	1																
6	Firm Size	.036	-.002	.057	.067	.337**	1															
7	International Activities	.068	.066	.112	.070	.152*	.203**	1														
8	RD Orientation	.428**	.176*	.453**	.359**	.137	-.034	.067	1													
9	Alliance Function	.156*	.256**	.280**	.190**	.152*	.094	.208**	.129	1												
10	Alliance number	.015	-.067	.106	.007	.331**	.272**	.322**	.092	.304**	1											
11	Past Performance	.726**	.278**	.626**	.651**	.172*	.054	.115	.406**	.120	.022	1										
12	Industry effect 1	.096	.320**	.169*	.199**	.098	.304**	-.156*	.126	.205**	-.015	.100	1									
13	Industry effect 2	-.067	.260**	-.077	.117	-.103	.189**	-.201**	-.144*	-.037	-.322**	-.043	.483**	1								
14	Country effect	.041	.049	.107	.043	.140	.019	.231**	.229**	.103	.105	.069	.012	-.185*	1							
15	Executive Age	.048	.046	.082	.076	.172*	.179*	.047	.232**	.165*	.045	-.059	.263**	.127	.197**	1						
16	Educational Level	-.037	.078	-.039	.001	-.086	.031	.079	-.194**	.059	.074	.003	-.102	.133	-.143*	-.259**	1					
17	Major in business	.022	-.010	.125	.012	-.037	.000	.066	.126	.114	.021	.145*	-.132	-.124	.086	-.085	.095	1				
18	Elite Education	-.039	.083	.021	-.008	-.047	.180*	.137	-.233**	.077	.079	-.032	.110	.251**	-.065	.003	.517**	-.055	1			
19	Tenure	-.002	.130	.025	.027	.110	.019	-.036	.197**	.002	-.110	.009	.095	.155*	.106	.537**	-.253**	-.046	-.019	1		
20	Output Functional background	.136	.077	.036	.110	-.063	-.057	.037	.026	-.193**	-.064	.110	-.097	.122	-.003	-.264**	.071	.078	-.028	-.223**	1	
21	Marker Variable	-.092	-.050	-.105	-.109	.041	-.090	.002	.030	-.106	-.015	.066	-.217**	-.150*	.012	-.288**	.089	.096	-.034	-.105	.214**	1
	Mean	19.358	14.363	51.255	34.324	26.032	627.503	44.676	6.005	0.653	21.332	18.968	0.295	0.642	0.942	0.000	0.000	0.347	0.416	0.000	0.358	5.084
	Standard Deviation	3.535	3.247	6.415	3.938	15.748	1931.820	25.842	0.892	0.477	19.972	3.627	0.457	0.481	0.234	1.000	1.000	0.477	0.494	1.000	0.481	3.617

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4 - 5: Test for multicollinearity

Variable Name		Collinearity Statistics	
		Tolerance	VIF
Controls	Firm Age	.751	1.331
	Firm Size	.675	1.483
	International Sales	.739	1.353
	RD Orientation	.622	1.608
	Alliance Function	.738	1.355
	Alliance number	.636	1.571
	Past Performance	.478	2.094
	Industry effect 1	.540	1.853
	Industry effect 2	.494	2.024
	Country effect	.842	1.188
	Zage	.565	1.770
	Educational Level	.593	1.688
	Major in business	.875	1.143
	Elite Education	.598	1.672
	Tenure	.623	1.605
Independent variable	Alliance Strategy	.686	1.459
Mediators	Individual Capabilities	.295	3.386
	Portfolio Capabilities	.301	3.327
Note: Firm performance is the dependent variable			

In order to examine construct validity of measures used in this study, a series of confirmatory factor analyses were conducted. First, I tested alliance capabilities construct as a second-order construct (Bagozzi, 1994), and this construct contains five dimensions – alliance proactiveness, alliance transformation, interorganisational learning, inter-organisational coordination and portfolio coordination as Model 1. The standardised loadings of alliance capability for its respective dimensions were 0.89, 0.84, 0.76, 0.73 and 0.92 ($p < 0.01$). The model fit of the second-order construct indicates a good overall fit: χ^2 */df* =1.76, Comparative Fit Index (CFI) = 0.96, Goodness of Fit Index (GFI) =0.89, Tucker-Lewis Index (TLI) = 0.95, Root Mean Square Error of Approximation (RMSEA) = 0.06. The main criteria of assessing model fit indices exceed minimum value, except for GFI which is less than 0.9 threshold.

Second, I tested the second-order construct for alliance capabilities as two factors – *individual-alliance capabilities* and *portfolio-alliance capabilities* as Model 2. Individual-alliance capabilities consist of alliance proactiveness, alliance

transformation and interorganisational learning. Portfolio-capabilities consist of interorganisational coordination and portfolio coordination. The standardised loadings of individual-alliance capabilities for its respective dimensions were 0.89, 0.85 and 0.76 ($p < 0.01$). The standardised loadings of portfolio-alliance capabilities for its respective dimensions were 0.73 and 0.93 ($p< 0.01$). The model fit of the second-order two-factor construct indicates a good overall fit: χ^2/df =1.77, Comparative Fit Index (CFI) = 0.96, Goodness of Fit Index (GFI) = 0.89, Tucker-Lewis Index (TLI) = 0.95, Root Mean Square Error of Approximation (RMSEA) = 0.06. GFI is the only index below 0.9 threshold; this is the same as the one-factor construct of alliance capabilities. All other indices are within a satisfactory value above 0.9. The RMSEA proved satisfactory since values at or below 0.05 indicate a good fit and values at or below 0.08 indicate an adequate fit (Steiger, 1990).

4.4.2. Common Variance Test with Marker Variable

Lindell and Whitney (2001) suggest that the best way to address common method variance is to include a scale that is theoretically unrelated to other scale in the survey. In my survey, a three-item marker variable was included between survey questions. To test common variance bias, I first checked the Cronbach alpha, composite reliability and AVE of the marker variable and these indicators were all within the specified level as shown in Table 4-2. Also, it is important to check the discriminant validity of the marker variable. The marker variable should have a non-significant or low correlations with the other variables in the study (Lindell and Whitney, 2001, Williams et al., 2010). I found the correlations between the marker variable with the other variables were mostly low and non-significant (See Table 4-4). This supports the discriminant validity of the marker variable.

In addition, Lindell and Whitney (2001) suggest to examine the significance of

correlations between the relevant predictors and the dependent variable when common method variance is controlled. The authors use mathematic equations to calculate the changes in correlations after CMV is controlled. I applied the mathematical formulae to my dataset and found that the variables had significant correlations with the dependent variables before CMV is controlled, they remain significant after CMV adjusted. Therefore, I can conclude that the correlations of relevant independent variables with dependent variable cannot be accounted for by common method variance as relevant variables still retain their significance.

4.4.3. Hypotheses Testing

To test my hypotheses, I used process procedure (Hayes, 2013) in SPSS. Process is a software add-on for SPSS and uses an ordinary least squares regression based analytic framework to calculate direct and indirect effects for mediating analysis (Hayes, 2013). I used this approach to test for mediation rather than Baron and Kenny's (1986) approach, because Baron and Kenny (1986) do not directly estimate indirect effect but infer indirect effects from a set of hypothesis tests (Preacher and Hayes, 2008). Baron and Kenny's approach (1986) for mediation requires the independent variable is related to both the dependent and the hypothesised mediator variable, and when the mediator variable is controlled for in a regression analysis, the relationship between independent and dependent variables becomes non-significant; it is full mediation or if the relationship between independent and dependent variable is substantially reduced, then it is partial mediation. A number of scholars have commented on Baron and Kenny's approach and suggested that indirect effect shall be quantified (Hayes, 2013) and total effect of independent variable should not be a prerequisite to searching for evidence of indirect effect (e.g. Hayes, 2009, Rucker et al., 2011).

Therefore, I chose the process procedure (Hayes, 2013) in SPSS to test my hypotheses. In a mediation model, the effect of an independent variable on dependent variable can be partitioned into two parts: 1) the direct effect of independent variable on dependent variable and 2) the indirect effect of independent variable on dependent variable via the mediator. Combined, the direct and indirect effect of independent variable on dependent variable is known as the total effect. I calculated a simple mediation model to directly estimate the indirect effect. The indirect effect is estimated as the product term of a and b (See Figure 4-1, 4-2 and 4-3). The product term of a and b together with the direct effect of c', these sum up to the total effect of the independent variables on the dependent variable. Also, I applied a bootstrapping method to calculate indirect effect with the general recommendation of N=10000 resamples (Hayes, 2013). For mediation analysis, mediation is occurred when the strength of the relationship between independent variable and dependent variable is reduced by including the mediator. In other words, c' is smaller than c, where c is the effect of the independent variable when moderating effect is not included in the model. When c' < c, it is a partial mediation. When c' = 0, it is a perfect mediation. Alternatively, if a*b (the indirect effect) is statistically significant, mediation has occurred. Figure 4-1, 4-2 and 4-3 illustrate the mediation path analysis of each mediation model.

Three separate mediation models were used to test my hypotheses. Each model consists of 16 control variables, alliance strategy as independent variable and firm performance as dependent variable, and the mediators are different in each model. The mediators are Alliance Capabilities (AC) in Model A, Individual-Alliance Capabilities (IAC) in Model B and Portfolio-Alliance Capabilities (PAC) in Model C. As recommended by (Hayes, 2013, Guendelman et al., 2011), the model coefficients, direct, indirect and total effects were reported in un-standardised form. The model

summary of each model is reported in Table 4-6, 4-7 and 4-8.

Model A (Table 4-6) shows a significant R^2 of 85%, and F-statistic was significant ($p < 0.01$). The independent variable of alliance strategy and the mediating variable of alliance capabilities are both significant at ($p < 0.01$). For the control variable, five of the control variables are significant: alliance number ($p < 0.05$), past performance ($p < 0.01$), industry effect 2 ($p < 0.1$), major in business ($p < 0.01$) and output functional background ($p < 0.05$).

Model B (Table 4-7) shows a significant R^2 of 80%, and F-statistic was significant ($p < 0.01$). The independent variable of alliance strategy and the mediating variable of individual-alliance capabilities were both significant at ($p < 0.05$) and ($p < 0.01$) respectively. Four of the control variables were significant: alliance number ($p < 0.1$), past performance ($p < 0.01$), major in business ($p < 0.01$) and output functional background ($p < 0.05$).

Model C (Table 4-8) shows a significant R^2 of 82%, and F-statistic was significant ($p < 0.01$). The mediating variable of portfolio-alliance capabilities was significant at ($p < 0.01$) and the independent variable of alliance strategy was at ($p < 0.05$). The significant control variables were R&D orientation ($p < 0.05$), alliance number ($p < 0.1$), past performance ($p < 0.01$), industry effect 2 ($p < 0.01$) and output functional background ($p < 0.05$).

4.4.3.1. Total Effect: Alliance Strategy on Firm Performance

The total effect is the effect of independent variable on dependent variable when mediator is not presented in the model, i.e. the c path. For example, the total effect of alliance strategy on firm performance is derived by summing the direct and indirect effects: $c = c' + ab$. For the three different mediators, the total effect of alliance strategy on firm performance are the same, as can be seen from the calculation below:

For alliance capabilities as mediator = -0.115 + 0.143 = 0.028.

For individual-alliance capabilities as mediator = -0.0924+0.1205 = 0.028

For portfolio-alliance capabilities as mediator = -0.086+ 0.114 =0.028

The total effect explains that the scores of managers who differ by one unit in alliance strategy are estimated to differ by 0.028 units in their firm performance. The coefficient is positive; this means managers toward portfolio strategy are likely to achieve a better firm performance. For Hypothesis 1 (H1), I hypothesised that a portfolio strategy is likely to lead to better firm performance. However, this effect is the same for all models, and it is not significant as it is not statistically different from zero; t = 0.4487, p =0.6542, with a confidence interval between -0.0963 to 0.1530. Therefore, Hypothesis 1 (H1) is not supported.

4.4.3.2. Indirect Effect: Alliance Capabilities as Mediator

The indirect effect is the effect of alliance strategy on firm performance through relationship alliance capabilities. Multiplying a and b yields the indirect effect, ab = 0.519*0.277 = 0.143. It is the effect of alliance capability on alliance strategy which, in turn, affects firm performance. This means two managers who differ by one unit in their alliance strategy are estimated to differ by 0.143 units in firm performance as a result of a higher tendency toward portfolio strategy with higher alliance capabilities because both a and b are positive, which in turn achieves better firm performance. This indirect effect is statistically different from zero, as revealed by a 95% bootstrap confidence interval that is entirely above zero (0.0366 to 0.2493). In addition, the normal theory based Sobel test (Z=2.80, p< 0.01) agrees with bootstrap confidence interval. The indirect effect showed that alliance capabilities mediates between alliance strategy and firm performance.

4.4.3.3. Indirect Effect: Individual-alliance Capabilities as Mediator

When multiplying a and b yields the indirect effect, a*b = 0.333*0.362 = 0.121. It is the effect of individual-alliance capabilities on alliance strategy which, in turn, affect firm performance. This means two managers who differ by one unit in their alliance strategy are estimated to differ by 0.121 units in firm performance as a result of a higher tendency toward portfolio strategy with higher alliance capabilities, because both a and b are positive, which in turn achieves better firm performance. This indirect effect is statistically different from zero, as revealed by a 95% bootstrap confidence interval that is entirely above zero (0.0238 to 0.2192). In addition, the normal theory based Sobel test ($Z=2.62$, $p < 0.01$) agrees with bootstrap confidence interval. The indirect effect showed that individual-alliance capabilities mediates between alliance strategy and firm performance. For Hypothesis (H2), I hypothesised individual-alliance capabilities mediate between alliance strategy and firm performance. The results of indirect effect support the hypothesis.

4.4.3.4. Indirect Effect: Portfolio-alliance as Mediator

When a and b are multiplied together, the indirect effect is 0.114 (a*b = 0.186*0.615 = 0.114). This is the indirect effect of portfolio-alliance capabilities on alliance strategy, which, in turn, affect firm performance. The indirect effect is statistically different from zero with a 95% bootstrap confidence interval that is entirely above zero (0.0244 to 0.2091). Also, the normal theory based Sobel test ($Z=2.37$, $p < 0.05$) agrees with bootstrapping confidence interval. The indirect effect shows a mediating effect of portfolio-alliance capabilities between portfolio strategy and firm performance. As a and b are positive, this means managers who have a higher tendency toward portfolio strategy with higher portfolio-alliance capabilities tend to achieve better firm performance. For Hypothesis (H3), I hypothesised that portfolio-

alliance capabilities mediate between portfolio strategy and firm performance. The result supports the hypothesis.

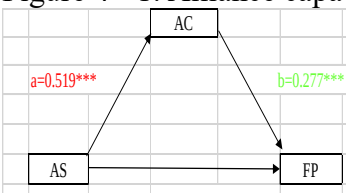
4.4.3.5. Direct Effect

The direct effect of alliance strategy on firm performance is the relationship between them controlling for mediator. I used three separate mediators – alliance capabilities, individual-alliance capabilities and portfolio-alliance capabilities – and each direct effect is estimated as c' = -0.115, -0.092 and -0.086 respectively (see Figure 4-1, 4-2 and 4-3). Take the example of alliance capabilities as mediator; the direct effect means that two managers differ by one unit on alliance strategy score but are equal on alliance capability scores, and are estimated to differ by 0.115 in firm performance score. The coefficients of the direct effect for the three separate mediating models are all negative, meaning that the managers have a tendency toward portfolio strategy with the same alliance capabilities score or zero alliance capabilities scores is estimated to be 0.115 units lower in the firm performance. This direct effect is significant as it is statistically different from zero, ($t = -2.9813$, $p < 0.01$) with a confidence interval from -0.1917 to -0.0390. The direct effect for other two mediating models are also significant as both are significantly different from zero ($t = -2.0438$, $p < 0.05$) and ($t = -2.163$, $p < 0.05$) and confidence interval are (-0.0032 to -0.1816) and (-0.0018 to -0.1699).

To sum up, the three separated mediating models all indirectly influenced firm performance through its effect on alliance strategy, as can be seen in Figure 4-1, 4-2 and 4-3. To conclude the mediating analysis for my hypotheses, Hypothesis 1 (H1) is not supported as alliance strategy was not significant for all three mediating models, as shown in the result of total effect when the mediator is not presented in each model. For Hypothesis (H2), I hypothesised that individual-alliance capabilities mediate

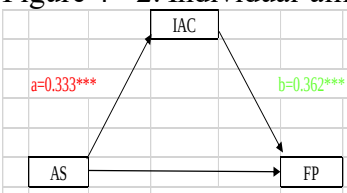
between alliance strategy and firm performance. This is supported by the indirect effect when individual-alliance capability is the mediator; the indirect effect is significant and the direct effect is significant. For Hypothesis 3 (H3), I hypothesised that portfolio-alliance capabilities mediate between portfolio strategy and firm performance. Both direct and indirect effect are significant. The indirect effect of portfolio-alliance capabilities as mediator show evidence that portfolio-alliance capabilities mediate between portfolio strategy and firm performance because the result shows that managers with a high tendency toward portfolio strategy and high scores on portfolio-alliance capabilities achieve better firm performance. Hence, Hypothesis 3 (H3) is supported.

Figure 4 - 1: Alliance capabilities as mediator



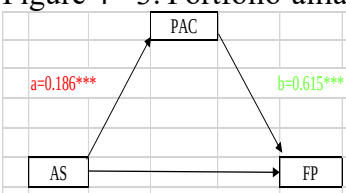
Model Coefficients												
		Firm Performance (FP)				Alliance Capability (AC)				Firm Performance (FP)		
		Coeff.	SE	p		Coeff.	SE	p		Coeff.	SE	p
Alliance Strategy (AS)	c	0.028	0.063	0.654	a	0.519	0.183	0.005	c'	-0.115	0.039	0.003
Alliance Capabilities (AC)									b	0.277	0.016	0.000
Constant	i_1	4.017	1.648	0.016	i_2	37.302	4.774	0.000	i_3	-6.315	1.148	0.000
		R^2= 0.588				R^2= 0.550				R^2= 0.853		
		F(17,172) = 14.426, p < 0.01				F(17,172) = 12.352, p < 0.01				F(18,171) = 55.183, p<0.01		
Indirect effect (a*b)		0.519*0.277 = 0.143										

Figure 4 - 2: Individual-alliance capabilities as mediator



Model Coefficients												
		Firm Performance (FP)				Individual Alliance Capability (IAC)				Firm Performance (FP)		
		Coeff.	SE	p		Coeff.	SE	p		Coeff.	SE	p
Alliance Strategy (AS)	c	0.028	0.063	0.654	a	0.333	0.125	0.008	c'	-0.092	0.045	0.040
Individual Alliance Capabilities (IAC)									b	0.362	0.027	0.000
Constant	i_1	4.017	1.648	0.016	i_2	20.870	3.250	0.000	i_3	-3.547	1.288	0.007
		R^2= 0.588				R^2= 0.513				R^2= 0.798		
		F(17,172) = 14.426, p < 0.01				F(17,172) =10.671, p <0.01				F(18,171) = 37.605, p < 0.01		
Indirect effect (a*b)		0.333*0.362 = 0.121										

Figure 4 - 3: Portfolio-alliance capabilities as mediator



Model Coefficients												
		Firm Performance (FP)				Portfolio Alliance Capability (PAC)				Firm Performance (FP)		
		Coeff.	SE	p		Coeff.	SE	p		Coeff.	SE	p
Alliance Strategy (AS)	c	0.028	0.063	0.654	a	0.186	0.077	0.017	c'	-0.086	0.043	0.045
Portfolio Alliance Capabilities (PAC)									b	0.615	0.042	0.000
Constant	i_1	4.017	1.648	0.016	i_2	16.433	2.009	0.000	i_3	-6.097	1.288	0.000
		R^2= 0.588				R^2= 0.506				R^2= 0.820		
		F(17,172) = 14.426, p < 0.01				F(17,172) = 10.376, p <0.01				F(18,171) = 43.241, p <0.01		
Indirect effect (a*b)		0.186*0.615 = 0.114										

Table 4 - 6: Model A summary

Model A							
Dependent Variable: Firm Performance			Sample Size: 190				
Independent Variable: Alliance Strategy							
Mediating variable: Alliance Capability							
	R	R^2	MSE	F	df1	df2	p
	0.9237	0.8531	2.028	55.1836	18	171	0.0000
	Coefficient	se	t	p	LLCI	ULCI	Significant
constant	-6.3148	1.1483	-5.4991	0.0000	-8.5815	-4.0481	
Alliance capabilities	0.2770	0.0158	17.5774	0.0000	0.2459	0.3081	Y
Alliance strategy	-0.1153	0.0387	-2.9813	0.0033	-0.1917	-0.0390	Y
Firm age	0.0049	0.0076	0.6452	0.5197	-0.0101	0.0199	
Firm size	0.0000	0.0001	0.3969	0.6919	-0.0001	0.0002	
International activities	-0.0032	0.0047	-0.6885	0.4920	-0.0124	0.0060	
RD orientation	0.0899	0.1468	0.6122	0.5412	-0.1999	0.3797	
Alliance Function	0.0132	0.2573	0.0513	0.9591	-0.4948	0.5212	
Alliance number	-0.0132	0.0065	-2.0283	0.0441	-0.0261	-0.0004	Y
Past Performance	0.2341	0.0407	5.7475	0.0000	0.1537	0.3144	Y
Industry effect 1	-0.2485	0.3107	-0.7998	0.4249	-0.8618	0.3648	
Industry effect 2	-0.5195	0.3055	-1.7003	0.0909	-1.1226	0.0836	Y
Country effect	-0.6465	0.4832	-1.3381	0.1826	-1.6002	0.3072	
Respondent's age	0.1737	0.1388	1.2512	0.2126	-0.1003	0.4476	
Educational level	0.0788	0.1341	0.5879	0.5573	-0.1858	0.3435	
Major in business	-0.7037	0.2296	-3.0644	0.0025	-1.157	-0.2504	Y
Elite Education	-0.0959	0.2672	-0.359	0.7201	-0.6233	0.4315	
Tenure	-0.0551	0.1334	-0.4135	0.6797	-0.3184	0.2081	
Output functional bacground	0.6167	0.2418	2.5501	0.0116	0.1393	1.0940	Y

Table 4 - 7: Model B summary

Model B			Sample Size: 190				
Dependent Variable: Firm Performance							
Independent Variable: Alliance Strategy							
Mediating variable: Individual Alliance Capability							
	R	R^2	MSE	F	df1	df2	p
	0.8935	0.7983	2.7847	37.6054	18	171	0.0000
	Coefficient	se	t	p	LLCI	ULCI	Significant
constant	-3.5467	1.2872	-2.7554	0.0065	-6.0875	-1.0059	
Individual Alliance Capabilities	0.3624	0.0271	13.3616	0.0000	0.3089	0.4160	Y
Alliance strategy	-0.0924	0.0452	-2.0438	0.0425	-0.1816	-0.0032	Y
Firm age	0.0060	0.0089	0.6801	0.4973	-0.0115	0.0236	
Firm size	0.0000	0.0001	0.3118	0.7556	-0.0001	0.0002	
International activities	-0.0030	0.0055	-0.5480	0.5844	-0.0138	0.0078	
RD orientation	0.0939	0.1730	0.5428	0.5880	-0.2476	0.4354	
Alliance Function	0.0438	0.3020	0.1452	0.8847	-0.5523	0.6400	
Alliance number	-0.0136	0.0076	-1.7870	0.0757	-0.0287	0.0014	Y
Past Performance	0.3343	0.0455	7.3507	0.0000	0.2445	0.4241	Y
Industry effect 1	-0.3284	0.3642	-0.9017	0.3685	-1.0474	0.3906	
Industry effect 2	-0.1467	0.3600	-0.4076	0.6841	-0.8573	0.5638	
Country effect	-0.7018	0.5661	-1.2396	0.2168	-1.8192	0.4157	
Respondent's age	0.2582	0.1623	1.5908	0.1135	-0.0622	0.5785	
Educational level	0.1245	0.1574	0.7909	0.4301	-0.1862	0.4352	
Major in business	-0.9103	0.2692	-3.3813	0.0009	-1.4417	-0.3789	Y
Elite Education	-0.2668	0.3150	-0.8471	0.3981	-0.8885	0.3549	
Tenure	-0.1089	0.1561	-0.6978	0.4862	-0.4170	0.1992	
Output functional bacground	0.7095	0.2832	2.5053	0.0132	0.1505	1.2685	Y

Table 4 - 8: Model C summary

Model C							
Dependent Variable: Firm Performance			Sample Size: 190				
Independent Variable: Alliance Strategy							
Mediating variable: Individual Alliance Capability							
	R	R^2	MSE	F	df1	df2	p
	0.9055	0.8199	2.4871	43.2419	18	171	0.0000
	Coefficient	se	t	p	LLCI	ULCI	Significant
constant	-6.0973	1.2875	-4.7356	0.0000	-8.6388	-3.5558	
Portfolio Alliance Capabilities	0.6154	0.0415	14.8444	0.0000	0.5336	0.6973	Y
Alliance strategy	-0.0858	0.0426	-2.0163	0.0453	-0.1699	-0.0018	Y
Firm age	0.0056	0.0084	0.6643	0.5074	-0.0110	0.0222	
Firm size	0.0000	0.0001	0.4297	0.6680	-0.0001	0.0002	
International activities	-0.0049	0.0052	-0.9394	0.3489	-0.0151	0.0054	
RD orientation	0.3446	0.1601	2.1519	0.0328	0.0285	0.6606	Y
Alliance Function	0.2771	0.2832	0.9786	0.3292	-0.2819	0.8361	
Alliance number	-0.0126	0.0072	-1.7509	0.0818	-0.0269	0.0016	Y
Past Performance	0.2562	0.0453	5.6627	0.0000	0.1669	0.3456	Y
Industry effect 1	-0.0773	0.3441	-0.2246	0.8226	-0.7566	0.6020	
Industry effect 2	-1.2179	0.3404	-3.5781	0.0005	-1.8897	-0.5460	Y
Country effect	-0.6829	0.5350	-1.2764	0.2035	-1.7390	0.3732	
Respondent's age	0.1441	0.1540	0.9357	0.3508	-0.1599	0.4482	
Educational level	-0.0587	0.1483	-0.3961	0.6925	-0.3514	0.2339	
Major in business	-0.3890	0.2556	-1.5220	0.1299	-0.8936	0.1155	
Elite Education	0.3944	0.2948	1.3380	0.1827	-0.1874	0.9762	
Tenure	-0.0764	0.1476	-0.5177	0.6053	-0.3679	0.2150	
Output functional bacground	0.5419	0.2681	2.0213	0.0448	0.0127	1.0711	Y

4.4.4. Post Hoc Test

At the initial correlation analysis, the inter-correlation between past performance and the moderating variables was high, although VIF test did not suggest there was a multicollinearity issue. I further conducted tests by excluding the past performance in my analysis to see if the mediating results of my analysis were the same. The results of the three mediating models are generally the same and as before, Hypothesis 1 (H1) is not supported, but Hypotheses 2 and 3 (H2 and H3) are supported.

4.5. Discussion

Successful implementation of firm strategy depends on a firm's resources and capabilities (Miles and Snow, 1984). The resource-based view suggests that firm resources and capabilities affect firm performance (Barney, 1991, Hitt et al., 2000, Ray et al., 2004). As firms are increasingly engaged in strategic alliances, understanding alliance strategies and alliance capabilities are therefore important to explain firm performance (Ireland et al., 2002). Prior studies have studied different kinds of alliance strategies (Ozcan and Eisenhardt, 2009, Parise and Casher, 2003, Hoffmann, 2007), which can be grouped into standalone and portfolio strategies. These studies tend to investigate either one-off standalone alliances or the alliance portfolios in firms. For example, some studies looking at standalone strategy show that firms with specific alliance objectives, such as entering into a new market, may be beneficial to international performance (Brouthers et al., 2014, Ireland et al., 2002, Nakos and Brouthers, 2008, Nakos et al., 2014).

In contrast, other studies focus on the alliance portfolio strategy and explore themes such as the synergistic effect of different alliances in the portfolio on performance (Cui and O'Connor, 2012, De Leeuw et al., 2014, Duysters et al., 2012, Hoffmann, 2005, Hoffmann, 2007, Jiang et al., 2010, Parise and Casher, 2003, Sarkar et al., 2009, Vassolo et al., 2004). Overall, studies have not asked which strategy leads to better performance – that is, they have not taken the two groups of alliance strategies together to explicitly compare their effect on firm performance. Consequently, it has been unclear whether the different alliance strategies firms adopt will influence firm performance differently.

The same problematic situation occurs in studies on alliance capabilities. Alliance capability studies suggest that alliance capabilities influence alliance success

and firm performance (Anand and Khanna, 2000, Heimeriks and Duysters, 2007, Kale et al., 2002, Kale and Singh, 2009, Lavie et al., 2012, Sampson, 2005, Sarkar et al., 2009, Schilke and Goerzen, 2010, Schreiner et al., 2009, Swaminathan and Moorman, 2009, Zollo et al., 2002). Scholars have implied that there are two levels of alliance capabilities, i.e. individual-alliance capabilities and portfolio-alliance capabilities (Kale and Singh, 2009, Wang and Rajagopalan, 2015), but none have not made distinctions between the two levels of alliance capabilities in their empirical studies. Analysing the literature on alliance capabilities, it becomes clear that, in earlier studies, scholars tended to study alliance capabilities for individual alliances (Doz, 1996, Dyer and Singh, 1998) while in more recent studies, scholars placed more emphasis on the capabilities required for managing an entire portfolio of alliances (Heimeriks and Duysters, 2007, Hoffmann, 2007, Sarkar et al., 2009). Other scholars make no distinction between capabilities for single alliances and capabilities for a portfolio of alliance, and focus on demonstrating that alliance capabilities, in general, positively influence firm or alliance performance (Anand and Khanna, 2000, Kale et al., 2002, Kale and Singh, 2009, Sampson, 2005, Schreiner et al., 2009, Swaminathan and Moorman, 2009, Zollo et al., 2002). The missing distinction between individual-alliance capabilities and portfolio-alliance capabilities leads to the lack of understanding on why firms with alliance capabilities may have different performance outcomes.

More importantly, despite the multiple studies on alliance strategies and alliance capabilities, we still do not know the linkage between alliance strategy and alliance capabilities. We do not know how these two complement each other in order to achieve better firm performance. In my study, I first showed that firms do have two different types of strategies when they forming their alliances – standalone and portfolio

strategies. However, these two kind of alliance strategies do not directly impact on firm performance.

Second, I made a distinction in two levels of alliance capabilities – *individual-alliance capabilities* and *portfolio-alliance capabilities*. Drawing on the resource-based view, which suggests that firm strategy needs resources and capability to implement (Barney, 1991, Miles and Snow, 1984), I argued that alliance strategy should not be studied in isolation but should be studied together with alliance capabilities in order to explain better or worse firm performance. The results of my study showed that individual-alliance capabilities and portfolio-alliance capabilities are the mediating influences between alliance strategy and firm performance. This is important because it demonstrates that a firm with an alliance strategy will not be effective if the firm does not have the right alliance capabilities in place. A firm cannot extract benefits from its alliance strategy without the necessary resources and capabilities.

In addition, when analysing alliance capabilities at different levels, I found that a firm that can match its alliance strategy with the suitable level of alliance capabilities will tend to achieve better firm performance. Firms forming alliances while ignoring the potential incompatibility between their alliance strategy and alliance capabilities may find that firm performance suffers as a result. Based on my study, firms that form alliances taking a standalone strategy require at least individual-alliance capabilities to achieve a better firm performance. A firm that forms alliances taking a portfolio strategy will require both individual-alliance capabilities and portfolio-alliance capabilities in order to achieve a better firm performance.

I make an important contribution to the literature by comparing standalone alliance strategy and portfolio alliance strategy. Prior studies suggest that there are two

kinds of alliance strategies (Ozcan and Eisenhardt, 2009, Parise and Casher, 2003, Hoffmann, 2007), and that firms' ability to capture value is likely to vary when they adopt different strategies (Lavie, 2007). As mentioned above, previous literature failed to take the two kind of alliance strategies together, which can lead to an incomplete picture of how alliance strategy affects firm performance.

Scholars also suggest that alliance capabilities are important for alliance success and alliance performance (Kale et al., 2002, Kale and Singh, 2009, Schreiner et al., 2009, Heimeriks and Duysters, 2007). However, strategic considerations are not taken into account when they analyse alliance capabilities and firm performance. There were no studies that brings the concept of alliance strategies and alliance capabilities together. Based on the resource-based view, I extend current understanding on alliance formation and firm performance by arguing that alliance capabilities should be taken into account when studying the relationship between strategy and performance. My result shows that the relationship between alliance strategy and firm performance is not significant; however, the same relationship mediated by alliance capabilities is significant. This implies that strategy alone is not sufficient in alliance operations. Adequate alliance capabilities are required to implement the strategy successfully. This is an important contribution to the alliance and strategy research, because theoretically we understand alliance capabilities are essential and complementary to firm strategy, but we did not know how it complements alliance strategy.

Moreover, my study is different from previous studies on alliance capabilities which tend to address alliance capabilities as a whole and analyse their different dimensions (Sarkar et al., 2009, Schilke and Goerzen, 2010). By clearly distinguishing individual-alliance capabilities from portfolio-alliance capabilities and highlighting their mediating effects on specific alliance strategies and firm performance, I

complement previous research by providing a more ingrained analysis of different alliance capabilities. Although previous literature already signalled that alliance capabilities are important to performance, and suggest that there are two levels of alliance capabilities (Wang and Rajagopalan, 2015, Kale and Singh, 2009), I specifically show the performance benefits of matching the right alliance capabilities with the chosen alliance strategy by including two kinds of alliance strategies together with different level of alliance capabilities in my analysis.

My results suggest that the two levels of alliance capabilities can potentially contribute to firm performance differently. Firms taking a standalone strategy will benefit from individual-alliance capabilities. Firms taking a portfolio strategy will benefit most with both individual-alliance capabilities and portfolio-alliance capabilities. In other words, a portfolio strategy involves both the capability to manage the individual alliances within the portfolio and the relationships between alliances inside the portfolio. Without the distinction between the two levels of capabilities, firms can only develop alliance capabilities in general and would be unaware that of how well their capabilities match with their alliance strategy and have blurred understanding on performance outcomes. My research is thus novel in showing that individual-alliance capabilities and portfolio-alliances capabilities contribute to performance differently.

In sum, by incorporating two kinds of alliance strategies with two levels of alliance capabilities, I contribute to alliance literature by highlighting that the identification of the level of alliance capabilities is required to match a firm's alliance strategy to achieve better performance. My study is the first to bring the concepts of alliance strategy and alliance capabilities together, and drives a better understanding on why firms need relevant resources and capability to implement its strategy when

forming alliances.

Limitations

Although this study provides valuable insights about alliance strategy, alliance capabilities and firm performance, it suffers from a number of limitations. First, I only used two industries from Taiwan and China to test my theories, thus the generalisability of findings to other industry may not be fully suitable. In addition, the level of alliance experiences in my sample firms are quite substantial, given that a high percentage of the sample firms have an alliance function in their companies and on average formed twenty-one alliances in the past five years. This suggests that my result may not be generalizable to industries or firms with less alliance experience.

Second, firm size was included as control variable in my study, but it was not significant. However, large and small firms do have different resources and capabilities endowment. In my sampled industries, I was unable to see the differences in my result. It would be valuable to further explore whether or not SMEs or multinationals might have different results from their alliance operations.

Third, although the common methods bias has been addressed, the data collection techniques could be improved. In my study, only perceptual measures of alliance strategy, past performance, firm performance and alliance capabilities were used. Scholars note that perceptual measures may be biased and reflect a desired state rather than an actual scenario (Brouthers et al., 2003). Future research efforts may consider to evaluate secondary data on the collections of firm alliances to validate firm alliance strategy. For past performance and firm performance measures, financial data from secondary sources can be used for triangulation.

Fourth, we collected the data on the tendency of choosing alliance strategy and after the choice was made. The responses may be an adjusted perception (Brouthers et

al., 2003, Brouthers et al., 2000). Future research may consider a longitudinal study, and, using improved measures, could clarify how alliance strategic orientation was formed and also the process to formulate its alliance strategy.

Fifth, response bias may be present. One of the cultural differences is that Chinese executives, or Chinese in general, tend to avoid extreme response options, or exaggerate in their answers. Krosnick (1999) suggests that avoiding extreme answers in survey may represent a response bias. Future research may consider designing the questionnaire differently to overcome this issue.

Finally, future research may consider extending the range and measure of the managerial characteristics in the control variables. This may help to identify other personal factors that have an influence on the tendency of alliance strategy. Additional factors may include socioeconomic background, such as income, cultural/ethnicity and religion, because these factors may influence one's attitudes, beliefs and behaviour. Future research may wish to focus on SMEs or multinationals to see if they have similar results to my study. In addition, future studies can use or develop other measures for alliance strategy to capture attributes that are not included in our study.

Managerial implications

My results have an important implication for senior executives who are in charge of alliance operations because executives' choice of alliance strategy can lead to the development of alliance capabilities and strong alliance capabilities tend to lead to a better firm performance. If executives understand what type of alliance strategies are suitable for their firms, they can plan suitable levels of alliance capabilities to implement alliance strategy. For executives adopting portfolio strategies, both levels of alliance capabilities, i.e. individual alliance capabilities and portfolio alliance capabilities, are essential to better manage alliance operations and achieve better firm

performance. For executives adopting standalone strategies, individual alliance capabilities are needed to achieve better performance results.

Executives must have a clear understanding of their existing alliance capabilities. If their alliance capabilities are not sufficient to implement their alliance strategies, they must plan how to acquire the necessary alliance capabilities. Managers need to ensure that their alliance capabilities are compatible with their alliance strategies.

In addition, firms are no longer able to work in isolation, and they increasingly create a portfolio of alliances and must work with different partners. A portfolio strategy may be more suitable in the long-run, regardless of size. Therefore, firms must develop both levels of alliance capabilities rather than only individual-alliance capabilities.

My results suggest that the choice of alliance strategy and firms' alliance capabilities can impact on firm performance. They are indispensable parts of firms' alliance operation.

Conclusion

By exploring the impact of alliance capabilities (individual-alliance capabilities and portfolio-alliance capabilities) between alliance strategy and firm performance, I add valuable insights about how the two different levels of alliance capabilities can benefit the implementation of firms' chosen alliance strategies. I also highlight the importance of possessing suitable levels of alliance capabilities, hence resulting in better firm performance. I add to knowledge by investigating the mediating effect of alliance capabilities between alliance strategy and firm performance, noting that alliance capabilities can lead to enhanced firm performance for firms with suitable alliance strategy.

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V. CONCLUSION

Strategic alliances have become popular among firms throughout the global business communities, and there has been much research on this form of business collaboration. Prior research suggests that strategic alliances often fail (Greve et al., 2010). Hence, scholars are interested to explain the formation of such corporate strategy and its impact on firm performance outcome (e.g. Hoffmann, 2007, Ozcan and Eisenhardt, 2009). My research complements previous studies that seek to explain why performance is different among firms (e.g. Anand and Khanna, 2000, Kale et al., 2002, Heimeriks and Duysters, 2007). I argue that a critical step to understanding a firm's alliance operation and firm performance is the executives' orientation toward firms' alliance strategies.

Firm performance is contingent on firm strategy and resource reconfiguration (Miles and Snow, 1984). Looking at alliance strategy is important and interesting because alliance strategy can determine how firms operate their alliances and impact on its performance (Hoffmann, 2007). Scholars suggest that firms tend to have either a standalone strategy or a portfolio strategy (Ozcan and Eisenhardt, 2009, Parise and Casher, 2003). The question is which of the two strategies do firms tend to have? How do they differ in firm performance? What could be the impact of choosing one strategy over another?

Managerial characteristics provide indications on firms' strategic choice (Brouthers et al., 2000, Hitt and Tyler, 1991). Agency theory suggests that compensation package may alter managerial behaviour (Jensen and Murphy, 1990). Building on upper echelons theory (Hambrick and Mason, 1984) and agency theory (Jensen and Meckling, 1976), I theorised in my first paper that managerial characteristics and compensation package are crucial to understanding why senior

executives adopt different alliance strategies. My first study shows that tenure predicts choice of alliance strategy. Longer-tenured managers have a stronger orientation toward a portfolio strategy while shorter-tenured managers prefer a standalone strategy. Furthermore, my study reveals that the level of compensation package, such as variable pay, potentially influences executives' decisions and behaviour. Findings highlight that executives with a business major and output functional backgrounds (i.e. sales and marketing) are even more likely to choose a standalone strategy when they receive a higher level of variable pay. Overall, the first study explains why different alliance strategies are adopted in companies. The choice of alliance strategy depends on managerial characteristics such as tenure, educational background, functional background and the level of variable pay they received.

In the second study, building on the resource-based view (Barney, 1991), I theorised that alliance diversity and alliance strategy are important for understanding performance differences among firms in their alliance operations. Many scholars suggest that alliance diversity influences firm performance (e.g. Goerzen and Beamish, 2005, Goerzen, 2007, Jiang et al., 2010), but the effect of alliance diversity on performance is still equivocal. This study contributes to previous research by adding an additional factor – alliance strategy – to explain the diversity-performance relationship. I found that for companies with a highly diverse set of partners, a portfolio strategy will help to improve firm performance, while companies that have a less diverse set of partners may not benefit from a portfolio strategy to improve firm performance. This implies that alliance strategy is important to manage a firm's alliance diversities and can improve firm performance because the potential benefits of diverse partners are the external resources and capabilities available to the companies. Top executives with an orientation towards a portfolio strategy are more

likely to focus on the combination of all resources and capabilities from different partners.

In contrast, firms with a widely diverse set of partners – a standalone strategy – will not help to improve firm performance, but a standalone strategy can help to improve firm performance when the firm has a less diverse set of partners. This suggests that firms with less of a degree of partner diversity can benefit from a standalone strategy rather than a portfolio strategy. Top executives with an orientation towards a standalone strategy tend to focus on the resources and capabilities from each individual alliance. Therefore, with a less diverse set of alliance partners, a standalone strategy is better than a portfolio strategy.

In the third study, building on the resource-based view (Barney, 1986, Barney, 1991, Ireland et al., 2002), I suggest alliance strategy and alliance capabilities are important to firm performance. I focus on the relationship between alliance strategy and firm performance as well as the impact of alliance capabilities on the relationship between alliance strategy and firm performance. Scholars have suggested that there are standalone and portfolio strategies (e.g. Ozcan and Eisenhardt, 2009), but there were no studies to understand the relationships between different alliance strategies and firm performance. I found that alliance strategies – standalone and portfolio strategies – do not directly impact on firm performance. However, alliance strategies become significant when companies have the suitable alliance capabilities in place. My study complements existing research (Kale and Singh, 2009) by demonstrating alliance capabilities are different for managing individual alliances and a portfolio of alliances. For firms with an orientation towards a standalone strategy, individual alliance capabilities are required in order to achieve better performance. For firms with an orientation towards a portfolio strategy, portfolio and individual alliance

capabilities are both required.

In sum, my study shows that the correct alliance capabilities need to be matched to the chosen alliance strategy in order to achieve superior firm performance. On the one hand, individual alliance capabilities and portfolio alliance capabilities complement a portfolio strategy. On the other hand, individual alliance capabilities complement a standalone strategy. Previous studies do not make distinctions between individual and portfolio alliance capabilities and therefore fail to explain why alliance capabilities may not always lead to better performance.

5.1. Contributions

From my three studies, I make several important contributions to the strategy and alliance literature. First, I contribute to the strategic alliance literature by showing why companies choose different alliance strategies. This is an important line of enquiry because the literature highlights different alliance strategies, but is unclear on what leads to the choice of different alliance strategies. My study suggests that managerial characteristics such as tenure, major subject studied, functional backgrounds and variable pay influence the manager's choice of alliance strategy. These aspects have not been investigated previously in the literature but are important for understanding why companies follow different alliance strategies. In addition, my study provides additional support to those scholars (Hoffmann, 2007, Parise and Casher, 2003, Ozcan and Eisenhardt, 2009) who suggest that firms have different alliance strategies and the choice of alliance strategy depends on managerial characteristics. My study also gives firms a better understanding of the differences between the two alliance strategies and provides insights on how managerial characteristics and compensation package influence alliance strategy. Thus, companies at board level can be more discerning when hiring top management and

when reviewing or designing executives' compensation packages that encourage a suitable alliance strategy for alliance operations.

Second, I contribute to the alliance diversity literature by providing an explanation for conflicting or inconclusive results between diversity and performance in current literature. By examining the effect of alliance strategy on the relationship between alliance diversity and firm performance, I tested three types of alliance diversities – partner diversity, functional diversity and governance diversity. Alliance strategy has an impact only on the partner diversity and firm performance relationship. I show that a portfolio strategy helps firms with a high partner diversity to achieve better firm performance, and a standalone strategy is more beneficial for firms with a low partner diversity. Therefore, the conflicting results in the partner diversity and performance relationship can be explained by including a strategic consideration, i.e. when firms choose an appropriate alliance strategy, as it can facilitate the management of partner diversity and result in better firm performance.

In theory, the two different alliance strategies influence how resources and capabilities obtained from different types of alliance diversities are managed and configured. However, I did not find alliance strategies impact on functional diversity-firm performance and governance diversity-firm performance relationships. For the functional diversity and firm performance relationship, my study confirms with previous studies that functional diversity is positively related to firm performance (Jiang et al., 2010, van Beers and Zand, 2014) but the impact of alliance strategies on functional diversity and performance relationship is not significant. The collaboration between different functions are often not the key consideration for alliance formation. Therefore, the benefit of having an alliance strategies is less important for managing and coordinating functional resources and capabilities than partner resources and

capabilities.

For governance diversity and firm performance relationship, my study does not confirm with previous studies that greater governance diversity is negatively related to firm performance (Jiang et al., 2010). In contrast, my study shows that greater governance diversity is positively related to firm performance only when partner diversity is also considered (See Model 4, Table 3-4). Interestingly, high partner diversity is likely to require different governance structures to manage value appropriation (Lavie, 2007), inter-organisational learning (Kogut, 1988) and transaction cost (Reuer and Arino, 2007), and low partner diversity is less so. Although I did not find the effect of alliance strategy on governance diversity and performance relationship, my study shows some differences from previous studies and raises an interesting question about the relationship between governance diversity and partner diversity.

Third, I contribute to the alliance capabilities literature by making a distinction between individual alliance capabilities and portfolio alliance capabilities, and linking them to alliance strategy. Previous studies do not link alliance strategy with alliance capabilities. My study is the first to bring the concepts of alliance strategy and alliance capabilities together, and this provides a better understanding on why firms need relevant resources and capability to implement strategy when forming alliances. My findings show that when the alliance strategy is linked with the right level of alliance capabilities, better firm performance will follow. In other words, a portfolio strategy requires individual alliance capabilities and portfolio alliance capabilities to work, while a standalone strategy requires individual capabilities. The matching of the right alliance capabilities with the chosen alliance strategy can benefit firm performance. Managers should be aware that if they favour standalone strategy they should develop

individual alliance capabilities within their firms in order to achieve a better performance. Likewise, managers who favour a portfolio strategy will have a better performance if both individual alliance and portfolio alliance capabilities are present in the organisation.

5.2. Limitations

Although this research provides valuable insights and contributions to different areas of alliance literature, it also suffers from a few limitations. First, I collected the data on the tendency of choosing alliance strategy after the choice was made. The responses may be an adjusted perception (Brouthers et al., 2003, Brouthers et al., 2000, Brouthers, 2013a) and potentially represent social desirability bias (Nederhof, 1985).

Second, I tested my theories based on two industries from Taiwan and China. I do not know if my finding is generalisable to firms in other industries, or in other countries, especially western countries such as the US and UK, or other developed countries. In addition, the sample firms had quite strong experiences on strategic alliances, and my result may not be generalisable to firms with less strategic alliance experiences.

Third, firm size was included as a control variable in my study, but it was not significant. However, large and small firms do have different resources and capabilities endowment. In my sample industries, I was unable to see the differences in my result. It would be valuable to further explore whether SMEs or multinationals might have different results from their alliance operations.

Fourth, response bias may be present. My observation is that Chinese executives or Chinese in general tend to avoid extreme response options, or exaggerate in their answers. Krosnick (1999) suggests that avoiding extreme answers in surveys may represent a response bias. It would be interesting to see whether executives from other

countries might answer the survey differently and produce a different result.

5.3. Future Research

While the research that I presented shows various valuable results and theorisation related to firm alliance strategies, alliance diversity and alliance capabilities, there are still many areas that can be improved and further explored. First, future research can take a different data collection approach, such as a longitudinal study, and consider using improved measures for alliance strategies. This may clarify how alliance strategic orientation was formed in more depth and provide a better understanding on how executives manage their alliance strategies. Also, a longitudinal study may facilitate the investigation on how different types of alliance diversities are formulated. This approach may allow to further test the theories from each of the studies.

Second, my study builds on upper echelons theory and agency theory to explain the choice of alliance strategy. Brouthers (2013b) suggest that executives make strategic decisions based on a number of firm-specific, industry-specific and country-specific factors . Managers may make decisions based on all these factors, which can influence the choice of alliance strategy and firm performance. My study did not include all factors. Therefore, future research can consider other factors by drawing on other theoretical frameworks that are important to alliance strategy, such as, transaction cost model (Brouthers et al., 2003, Brouthers, 2013a), resources dependence theory (Ozcan and Eisenhardt, 2009) and social network theory (Gulati et al., 2000), or to combine these theories with upper echelons theory as well as agency theory, which I presented to examine the choice of alliance strategy. This may offer alternative or complementary views on the choice of alliance strategy and extend our understanding of alliance strategy and firm performance.

Third, I included a measure of alliance experience as a control variable in my study. A recent study suggests that explorative and exploitative alliance experiences influence innovation performance (Subramanian and Soh, 2016). Further distinguishing explorative and exploitative alliance experiences may reveal more information on alliance capabilities, and the potential impact on alliance strategy and firm performance.

Fourth, my research shows that different alliances strategies have different impact on performance. Future research may explore different facets of alliance strategies. For example, firms are no longer able to simply work in isolation. Firms need to learn to co-create with various partners in order to achieve better performance on collaborative projects. There is still little understanding on the co-creation of products and services in the strategic alliance context. Future research may build on my research and explore co-creation in alliance strategy.

5.4. Managerial Implications

My study confirms that managers have different orientations toward their alliance strategies to manage their alliance operations. Some tends towards a portfolio strategy, while others tend towards a standalone strategy. My study, like the previous work of Parise and Casher (2003) and Ozcan and Eisenhardt (2009), suggests that companies can benefit from a portfolio strategy because managers adopt a holistic view on how to reconfigure and recombine firm resources to achieve companies' objectives. In particular, my study indicates that firms can achieve greater performance if they adopt a portfolio strategy when the firms have a diverse set of partners, i.e. high level of partner diversity. However, firms may not benefit from a portfolio strategy if they only have limited types of partners, i.e. low level of partner diversity.

Moreover, managers who were previously confused about why diversity may

lead to better performance in some cases but not others can now understand that alliance strategy is a determining factor. Different alliance strategies will lead to firms managing resources and capabilities differently, hence influencing the impact of diversity on firm performance. Therefore, in order to reap the benefits of diversity, managers need to decide not only on high versus low diversity in alliances but also the appropriate alliance strategy for the chosen level of diversity.

In addition, my study suggests that companies can achieve better performance if they possess both individual and portfolio alliance capabilities to implement a portfolio strategy. If companies choose to operate a standalone alliance strategy, they should at least possess individual alliance capability. In contrast, if companies choose a portfolio alliance strategy, they should possess both individual and portfolio alliance capabilities. It is imperative for managers to understand what kind of alliance strategies their companies should adopt. Managers should also have a clear understanding of their existing alliance capabilities and ensure that their alliance capabilities match with their alliance strategy. This way, managers can plan for a suitable level of alliance capabilities to implement the alliance strategy they choose.

In conclusion, my research provides a more in-depth analysis of alliance strategy and contributes to a better understanding of why alliances may fail or succeed. When studying alliance performance, it is important to understand that managerial characteristics of top executives can lead to a standalone alliance strategy or portfolio alliance strategy. Having a standalone alliance strategy or portfolio alliance strategy has a different impact on a firm's performance. In particular, if there is a high level of diversity in the alliances, a portfolio alliance strategy can enhance the benefits of alliance diversity on performance while a standalone alliance strategy less so. Firm performance is also affected by how well the capabilities are matched with the chosen

alliance strategy. This research complements previous alliance strategy research by underlining the importance of distinguishing standalone versus portfolio alliance strategy and highlighting the ramifications such distinctions can bring to the understanding of firm performance.

5.5. References

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Appendix A. Elite Universities in China

Peking University	Tsinghua University
Fudan University	Wuhan University
Zhejiang University	Renmin University of China
Shanghai Jiao Tong University	Nanjing University
National University of Defense Technology	Sun Yat-Sen University
Jilin University	University of science and technology of China
Huazhong University of Science and Technology	Sichun University
Bejing Normal University	Nankai University
Xian Jiao Tong University	Central South University
Tongji University	Tianjiang University
Shandong University	Harbin Institute of Technology
Xiamen University	Southeast University
Beihang University	Northeastern University China
Chongqing University	East China Normal University
Dalian University of Technology	Beijing Institute of Technology

Source: Chinese Alumni Association 2016

Appendix B. Elite Universities in Taiwan

National Taiwan University	National Tsing Hua University
National Chiao Tung University	National Cheng Kung
National Taiwan university of Science and technology	National Yang Ming University
National Taiwan Normal University	National Sun Yat-Sen University
National Central University	Taipei Medical University
Chang Gung University	National Chung Hsing University
National Taipeu University of Technology	National Cheng Chi University

Source：QS World University ranking 2015-16